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New Construction in Metal Airplanes

By Fred H. Colvin
Editor, American Machinist

METAL is unquestionably taking the place of wood in airplane construction. But neither the type of construction nor the kind of metal to be used are as yet agreed upon by the industry as a whole, nor is such agreement likely to be reached in the immediate future.

In small airplanes for personal and commercial service, steel tubing is used almost exclusively in the fuselage construction, and to some extent for rudder frames, stabilizers, elevators, and ailerons. Wing beams and ribs continue to be made of wood in many planes of various types. In some of the larger planes, notably the Stout, now built by Ford for commercial work, and in the planes built by the Glenn Martin Company for the Navy, very little steel is used, aluminum alloy being preferred for the fuselage, wing beams, ribs, and many other parts. The Ford plane even uses thin aluminum alloy sheets as a covering for both fuselage and wings, while the Martin Company still adheres to fabric for this purpose. There are also other builders using aluminum alloy to a greater or lesser extent, but the two named are the largest users, and have had the most experience with it.

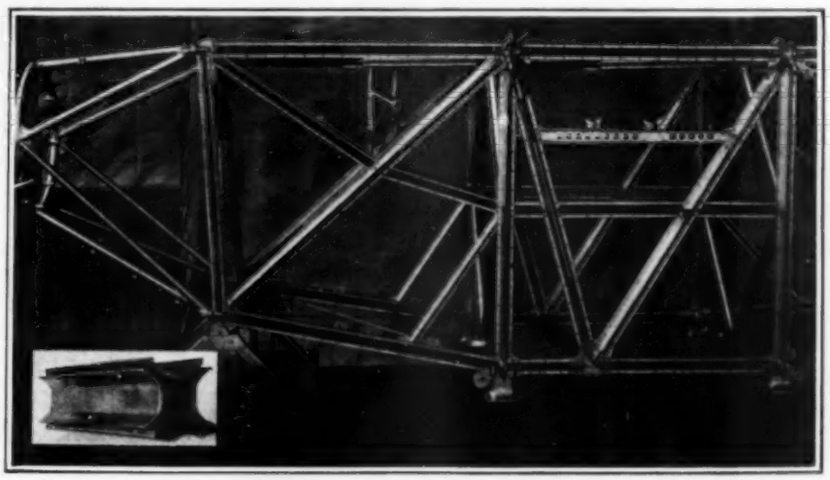


Fig. 1 — Section of a fuselage of the new plane for the U. S. Navy, showing the type of structural members used. The various struts and beams are built up of four pieces formed from sheet aluminum-alloy and riveted together with suitable spacers, to form hollow columns

A completed fuselage built up of steel tubing looks simple in construction, while the fuselage built up of aluminum alloy sections that must be riveted, appears at first glance to be much more complicated. Those who have had con-

The first of three articles. The second will appear in an early issue.

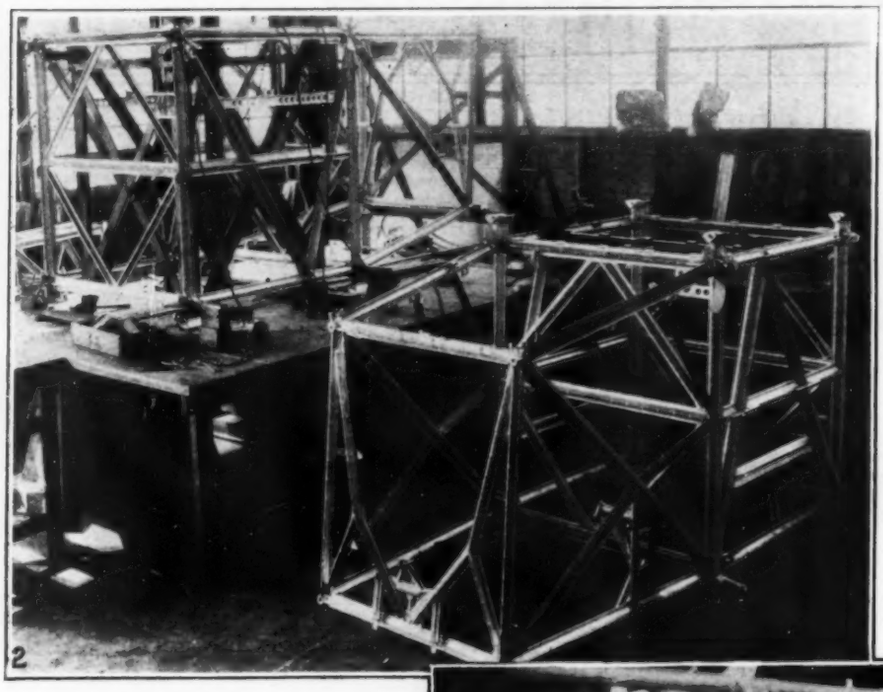


Fig. 2 — The forward section of the fuselage being assembled in a special fixture on the bench at the back, together with an assembled section on the floor in the foreground. This illustration gives some idea of the type of fixture used, and also shows more of the fittings used in joints of various kinds and shapes. The combination of aluminum-alloy struts and steel fittings seems to make it possible to secure both strength and accuracy at a minimum cost

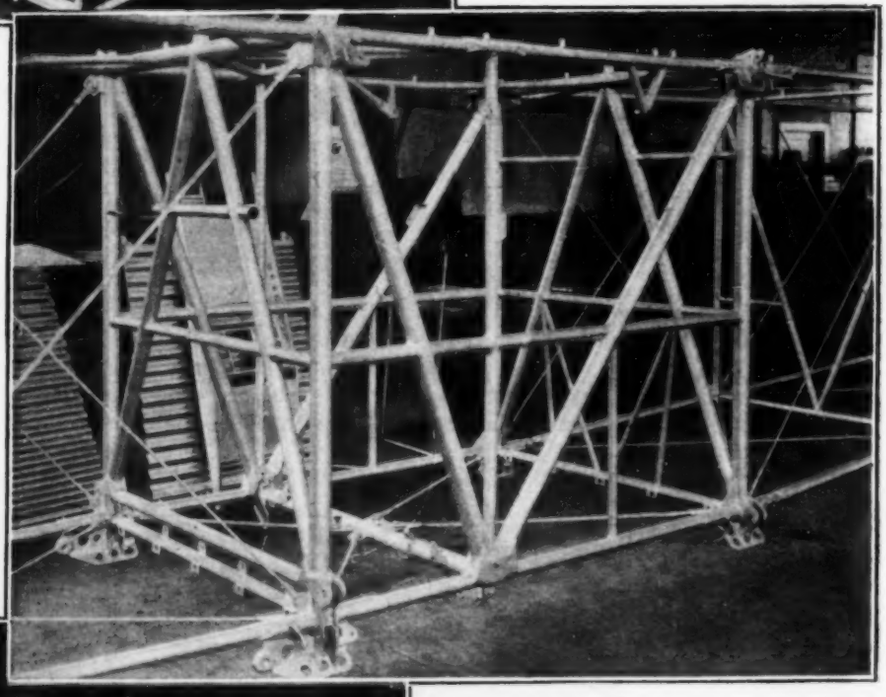


Fig. 4 — Fuselage bulkheads being assembled in special fixtures on benches at a convenient height. Showing the extent to which this method of construction is being carried, and the amount of work of the kind being done in the Martin plant. In the background are the racks, where the parts that go to make up the various units are stored until wanted for assembly

Fig. 3 — A section of a somewhat similar fuselage built up of steel tubing with welded joints. An excellent example of this form of construction, showing how fittings are readily built up to any desired shape by means of welding

siderable experience with both methods, are, however, strongly advocating the use of high strength aluminum alloy and the riveting process. It has been their experience that, while welded tubing can be used with fair success on comparatively small production, the method has serious difficulties when it is desired to increase production by the use of standard parts that must be interchangeable.

Alignment of the fuselage is essential in securing economical assembly and in producing a plane that performs as it should. This, it is claimed, is exceedingly difficult with a construction of welded tubing. For, no matter how carefully the welding fixtures are made, there is found to be sufficient change in expansion and contraction to cause more variation than is permissible. Unequal contraction frequently causes bowing or other distortion of important members of the structure, which means delay in securing the finished product, as this distortion must be corrected before the section can be assembled. Cracks also develop occasionally, and the problem of cutting out a cracked piece may involve replacing a number of joints and invite still further distortion or cracking.

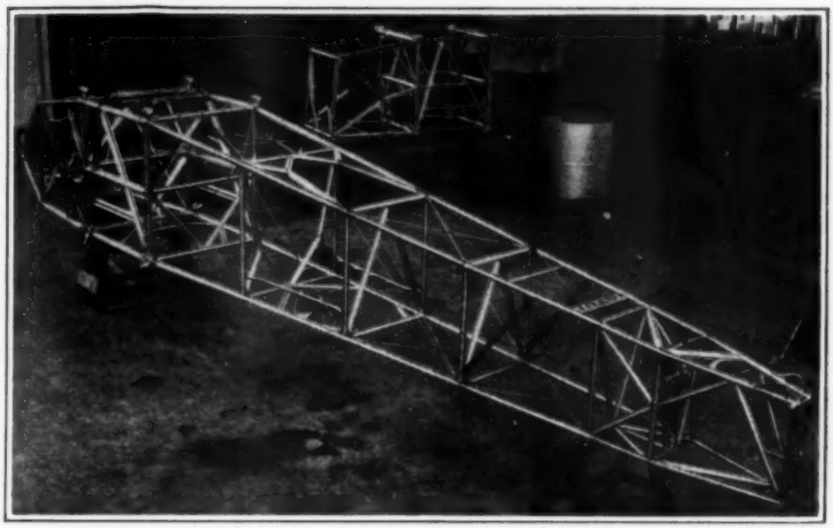


Fig. 6—A complete fuselage for one of the new Navy planes, showing the use of the new Eureka section in almost its entire construction. There are shown clearly the kinds and locations of joints, and the way in which this form of strut lends itself in the commercial production of both straight and angular joints. As shown, the fuselage is upside down. Another fuselage assembly is under way in the background

Welding is, however, conceded to have its good points in airplane construction, and there are numerous places where it can be used without running into the difficulties mentioned. For the engine mount, the welded, steel-tube construction is in general favor.

After a careful study of existing shapes to be had in aluminum alloy, the engineers of the Martin company developed a built-up section, now known as the Eureka section, and resembling the old Phoenix section that has been used extensively in building construction in years gone by. The new design, however, differs from the old Phoenix section in having flats instead of circular arcs between the joint angles. On the small sizes used in airplane construction, the flat surface has advantages in making 45-deg. connections, and it is also easier to produce.

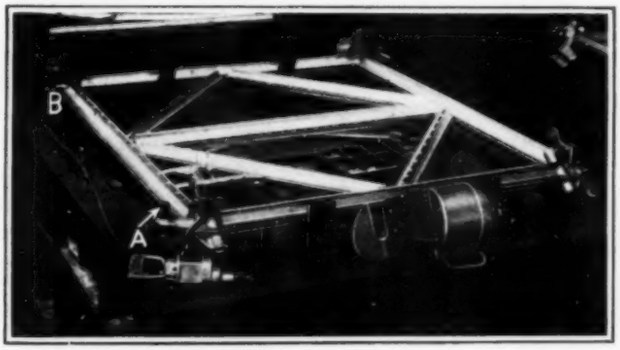


Fig. 5—One of the assembly benches showing the pins and other supports by which the various fittings are kept in alignment while the rivet holes are being drilled with the portable drill shown, and the rivets are put in place by the special pneumatic squeeze-riveter designed for this purpose

The headpiece shows the new planes being built for the U. S. Navy by the Glenn L. Martin Company. Previous planes built under four different contracts had steel tubular-fuselages and wooden wing frame construction, cloth covered. These planes were equipped with 12-cylinder, water-cooled engines. The present airplanes have fuselages of high-strength aluminum alloy. The steel used for fittings is chrome-molybdenum.

A little study of a few of the joints on the fuselage of the new Navy plane, shown in Fig. 1, will show how well this built-up section adapts itself to joints of various kinds. Bearing in mind that the structural section can be separated by spacers of any desired thickness, and examining a few of the joints at various points, it will be seen how easy it is to produce almost any kind of a joint desired, regardless of the angles or of the number of pieces coming together. By providing suitable fittings, which is now easily possible with the welding apparatus available, it is an easy matter to slip struts over the fittings at any angle and secure them solidly in place.

Almost any strength of joint can be assured by designing the fittings for the particular place. A careful study of the many different joints will show how the various kinds of joints are made and the ease with which difficult angles can be riveted into a complete structure. The engine mounting is of steel tubing, held in position by four through bolts which seat in a recess made by the somewhat unusual connection at the four corners of the engine mount. In Fig. 2 are shown the two forward sections of the fuselage, which also give a good idea of the way in which the various joints are made. On the bench is an assembling fixture for these sections, which shows how the various members are held while being drilled and riveted.

In contrast with the aluminum-alloy structures shown,

it is of interest to compare the section of welded steel tubing shown in Fig. 3. This view also shows how conveniently the welding process can be used in the production of fittings composed of various parts, and at different angles, even if welding is not employed in the whole structure. A method of increasing the area of the welded joints, by what is known as fish-tailing, is seen where both the upper and lower tubes enter the reinforcing tube outside the fitting.

The fixtures used in assembling some of the units, the fuselage bulkhead in this instance, are shown in Figs. 4 and 5. Fig. 4 shows ten assembly benches and the stock rack at the rear, in which the units that go to make up the various pieces are stored after they come from the presses. This view gives some idea of the extent to which this form of metal construction is now being used in the Martin plant. On the second bench at the right, the various members have been placed in position; the illustration shows some of the fittings used and the way in which they are assembled. In the foreground are the electric drill and the special pneumatic squeeze-riveter that was designed especially for this job and which is made in several sizes for work of different kinds.

The enlarged view, Fig. 5, shows how the fittings are located by plugs, as at *A* and *B*, and how these fittings go into the openings between the members of the Eureka section. With the fittings and other members held in position in this manner, the holes drilled and the parts riveted while they are held in position on the assembly fixture, there is no question as to the various sub-assemblies fitting together on the erecting floor.

The completed framework of a fuselage is shown in Fig. 6 in an inverted position, while in the background is a section of another fuselage and one of the special fuel tanks, about which more will be said later. A careful examination of Fig. 6 will show how well the Eureka section can be utilized in making joints at almost any angle. Owing to the varied and severe requirements of a military plane, this fuselage is considerably more complicated than would be the case if it had been designed for commercial purposes. In other words, if a section or method of assembly can be used in such a complicated structure as this, it can be all the more easily utilized in work where the requirements are not so severe. The method of producing these sections, as well as other interesting features, will be shown in a second article.

Mass Production Abroad

A feature of the first issue of 1929 is an article by Herbert E. Taylor, of Hotchkiss & Company, Paris, on a system of manufacturing that is out of the ordinary. Mr. Taylor's ideas seem a little extreme and they should therefore draw good discussion from American production executives. We shall publish the discussions to develop the full possibilities of the plan.

SEEN · AND · HEARD

By John R. Godfrey

High cutting speeds and smooth finish

HIGHER cutting speeds are on the way. The newer "high-speed steels" and the other cutting materials that we think of as steels, but are not, are once more beginning to change the complexion of machine shop practice. Planer speeds are going up with the rest, in spite of the handicap of starting and stopping the motor, the table, its load, and all the metal between. One good planer builder expects to see the high-return speed also used as the cutting speed.

But there's a snag in the process—the kind of finish that can be had at the higher speeds. It doesn't seem to be a question of vibration, as might be expected, but of the tool tearing out small particles of metal instead of cutting them. Those who use the microscope a lot in such matters say that is why the diamond boring tool in brass piston pin bushings leaves such a nice finish. It *cuts* the particles instead of tearing them out, rolling them over under the tool, and leaving scratches.

This planer man gets a beautifully smooth finish on cast iron at about 40 ft. a min., but when he jumps the speed to 70, the aforementioned scratches appear in spite of the greatest precautions he can take. Naturally he wonders, will these new cutting metals that rival the diamond in hardness actually cut the particles and avoid the roughness due to tearing?

* * * *

In contrast to this I ran across a shop with a brand new, extra heavy duty planer, motored with a control box to give a minimum cutting speed of only 6 ft. a min. Instead of high speed planing this shop is all set to reverse the process and machine wide surfaces at a single stroke of the planer. Broad faced cutting tools, with the cutting edges at quite an angle to the work, are each to rough-machine surfaces between 3 and 4 in. wide. And this planer is to replace a large miller because it is believed that it can remove the metal more rapidly.

* * * *

There is another point to remember before we begin to scrap all existing machine tools—that many kinds of work will not permit of extremely high speed or heavy cuts, especially the latter. Distortion plays such an important part in the machining of light pieces that it is frequently cheaper to machine at a lower rate than to salvage or scrap pieces afterward.

In some of these cases the new cutting alloys may be of great service by permitting high speeds and light cuts, as in grinding. One difficulty from the machine builders' point of view is that he may be asked to build both old and new types of lathes and other machines. In most cases, however, the new type of machine gradually supplants the old, even if the old might have answered most of the requirements in special cases.

Overhead and Profits

THREE men were sitting in the little office of the president of the Eastham Machine Company, Job Doolittle, Josiah Perkins, his treasurer and bookkeeper, and, of course, Bill Holland. It was hot outside, and all three were in their shirtsleeves. But evidently all the heat in the room was not due to the efforts of the sun.

"Well," burst out the president and general manager, "the fact remains that we didn't make a plugged nickel on that sale of five machines to the Wellington outfit, and we certainly ought to have made a good thing out of that order."

"Must be something wrong with your costs, or the way you set your selling price, Job," remarked Holland.

"Maybe so, but Jo, here, has been figuring them for us for thirty years and he ought to know his stuff by this time."

"Sure, but times do change, you know, and it may just be that there are some new wrinkles in accounting that he isn't familiar with. Do you get a chance to go to accountants' meetings very often, Mr. Perkins?"

Perkins looked uncomfortable. "Well, no, sir. The fact is I don't believe I've been to such a meeting in five years. We're a little off the main line here, Mr. Holland, and Job doesn't seem to put much stock in meetings, or visiting around."

Holland grunted, but did not say anything. His expression was eloquent, however.

Doolittle finally broke the silence. "Maybe I'm old-fashioned, Bill, but we used to make a pretty good living by figuring material, labor and overhead, and then adding on a fair profit, say ten per cent. But competition is pretty stiff now, and I have to shade my profit some to get the business. I shaded it pretty close on this order because I figured that with five machines going through we could save something in the shop."

"But you didn't," said Holland. "I know how it is. You want that business so bad you forget all about making any return on your investment, and you cut your margin until you don't."

This was so true that neither of the others had anything to offer. They sat, looking hot and miserable.

"Tell you what you do. You add into your overhead two items, the going interest rate on your capital investment, and also the depreciation on your equipment, based on replacement value, not original cost."

Perkins gasped. "But," he blurted out, "that's contrary to established accounting practice. It isn't done!"

"Oh, yes, it is," was Holland's rejoinder. "Only last week I saw that system working in a shop not much bigger than yours. Perhaps it's a roundabout way to get results but I believe it's the only one when you get in a fix like yours. Try it. Sorry, but I've got to run. So long."

"But it isn't orthodox," wailed the poor treasurer after him.

The president said nothing, but he looked relieved.

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Discussion

Beware of Stratification

An organization is not a rabble of men, nor is it a group of men divided by many limitations. It is a living thing, capable of growth, expansion, and the elimination of the most serious faults within itself. An organization is roughly: A grouping of departments or units as a whole, a composite of inner relationships, and the state of mind of all within it. Management must recognize the symptoms, and remove the cause of stratification, or disease will result.

Every foreman or officer should have his first and second lieutenants who can act in his absence, or permit him to be promoted. If he is

the right sort he may, as a good executive, advance ahead of them or be man enough to step aside and let the other fellow pass on and up.

Every person in an organization, having definite mental capability, should proceed in an orderly and co-operative manner in all his work whether he is president, foreman, or workman. They will then all be working to the same end for output, growth and development of the individual and of the company.

Real selection of the best men, and training of the right sort is the normal solution of the problem, but it must be a definite policy over many years, and each case must be considered on its own merits. —N. R. FLINT.

The problem of providing executives to fill future vacancies or to take care of plant expansion is a problem that must be faced by every chief executive to a greater or less degree, according to the nature of his plant and the product being manufactured.

With the introduction of so much special machinery and special manufacturing methods, plants which may be producing a similar article may be very different in the equipment and methods used to produce it. This calls for specially trained executives and the chances of obtaining such men in the open labor market, is very remote.

It therefore behooves the chief executive to develop future executives from among the rank and file of his workmen. This is not always an easy problem, but if thought has been given to the method used in selecting and the training of these men, good results can be obtained.

Most shops have a means of recognizing good workmen by the good work which they produce, and it is from among this group that executives can be developed. While it is conceded that all good workmen do not make good executives, it is also conceded that a good executive must first be a good workman. By analyzing the qualifications of these men, executive ability will be discovered where it exists, and it is then the responsibility of the chief executive to develop this ability according to a predetermined plan. It has been my experience that where such a plan is in effect workmen are encouraged to take more interest in their work and their personal development. —C. L. ANDERSON.

Paying for Advice

I agree with Tom Hudson, the contract shop proprietor, that mechanical men give away too much good advice, but like Mr. Holland, I would caution against springing it too suddenly on a spoiled public. Tradition is a big factor in the architect's fee, the lawyer's fee, or the doctor's fee. In addition, there is the stage setting which helps in no small way to gain acceptance of the idea. The office of these professional men is organized on the fee basis, everything impresses one with the fact that it is necessary to charge, diplomas, books, and professional society membership certificates. Contrast this with what Tom Hudson's office probably looks like—informal, cluttered up, and utterly lacking in professional diginity.

So, If I were Tom Hudson, I would fit up my own office, or better yet, a special office, with a sign on the door "Tom Hudson. Mechanical Consultant," to begin with. Then I'd put all my mechanical books around that office, hang my school diploma, apprenticeship certificate, and local organization membership shingles, about the walls.

When my "free advice" friends dropped into my regular office and began "working" me, I would invite them over to the new office, so that I might consult some of my books. Even if the answer were not in any book, I would use the pretext anyhow. It is surprising how much the resemblance to an office in which they are accustomed to pay for advice, will ease the shock of a request for a fee. It may take time to overcome tradition, but I like Tom Hudson's idea of wanting to pioneer the way toward correction of this abuse. —RUSSELL T. WALKER.

Profits for Builder and User

It is often poor policy to turn down a good machine simply because the first cost seems high. Even if that first cost represents a larger profit to the machine builder than the prospective user is able to obtain upon his products, that is beside the point at issue. If the user did not chance to know the profit margin, it is likely he would judge things purely from his own standpoint.

If the machine can justify itself by effecting economies, that point should be a prominent factor in the issue. Certainly, the wise acceptance of up-to-date equipment and the skilled use of it, do show up particularly well in the year's balance sheet. If such an outlay is going to increase the user's profits to a marked extent, or enable him to compete with keen rivals, it is a matter for serious consideration upon the real merits of the case, as it affects him as user. He may lose a very good thing for himself by haggling over a few dollars.

It has to be remembered, too, that just as a surgeon's fees may seem high, considered apart, the whole question has also to be judged in relation to the outlay of time, experience, and total costs. Some machines are the outcome of expensive research and development. Costs will fall as demand increases, and this again may reasonably be expected to figure in the later selling prices.

—W. R. NEEDHAM, *England.*

The "Pressfinish" Method for Enlarging and Polishing Holes

By Dr. Otto Schlippe
Berlin, Germany

Research, in which balls were forced through 0.787-in. holes, indicates that this method results in high polish, increased hardness, and satisfactory accuracy

BETTER polish on the surface of holes is obtained with soft materials, by pressing balls through the holes, than by the usual reaming operation. The diameter of the ball exceeds that of the hole by a small amount. This method has been called the "pressfinish" method by the Swedish engineer Gunnar Mattson.

The parts tested in this research were in the shape of

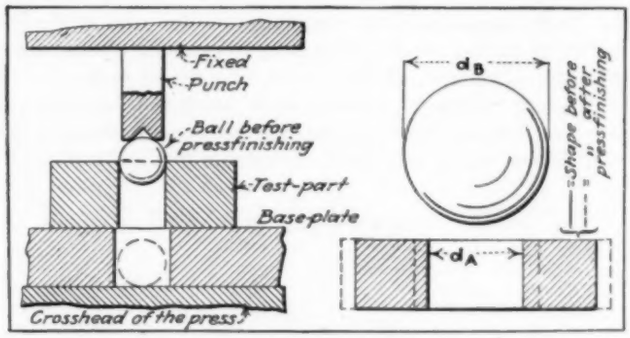


Fig. 1—Balls from 0.787 to 0.792 in. in diam. were forced through 0.787-in. holes in rings with outside diameters of 1.18 to 3.15 inches

rings or bushings. As shown by Fig. 1, the parts lie on the base-plate of a press, the base-plate having a hole into which the ball falls after having passed through the test part. The motion of the ball is caused by a fixed punch, the base-plate and the test-part going upward through the action of oil under pressure.

In each test the minimum and maximum diameters of the hole were measured by a special instrument called the Microtast. This instrument was used in combination with an apparatus suited for measuring internal diameters. Besides the maximum and minimum diameters of the hole in three positions of height, before and after pressing the balls through the hole, the diameters of the balls before and after pressing were measured in each test. The external diameter of the test-piece was measured before, during and after each test, but only in the center of the test piece.

The investigations were made on open hearth steel, machinery cast-iron, perlite cast-iron, bronze, and 80-per-cent-tin white metal. All holes were 0.787 in. (20 mm.) in diameter. Nine sizes of balls varying in diameter from 0.787 to 0.792 in. (20 to 20.12 mm.) were used.

Increase in the diameter of the holes is shown, in Fig. 2, as a function of the oversize of the balls in relation to the original reamed hole. By "oversize" is meant the *difference* ($D_B - D_A$) of the original diameters of ball and hole. (See Fig. 1). Evidently the curves for each of the materials, drawn through the points corresponding to the test results, are based on a square function, excepting those of the open hearth steel, which is based on an exponential function. The answer is given by Fig. 2 to the question: What size of ball is to be used for enlarging the hole to the size desired? In Fig. 3 are shown the total and the permanent increases in the external diameters of the test piece, and the force necessary to force the ball through, all as affected by the oversize of the balls. The pressing forces were measured with a manometer in connection with the oil operating the machine. The forces are of such size that the operation could be done by an ordinary press, even by hand, within a few seconds.

The influence on the size of the hole is seen at the left hand side of Fig. 4. In each test the maximum and minimum diameters of the same hole were measured, not in the same position of height, but along the length of the surface. The greatest difference of the diameters are shown in the figure in the form of fields of tolerances. It will be seen, that by using balls of increasing diameters, the size of the hole and also the real form of the cylinder become more exact at first, for the area of the corresponding fields decreases. On the other hand, after an optimum, deviations from the geometrical form of the cylinder increase. It was observed that, by using balls of large oversize, the holes became double cone- or double bell-shaped, the smallest diameter being at the center. It is evident that such a result is quite unsatisfactory. Therefore, only small oversizes of balls are allowed to be

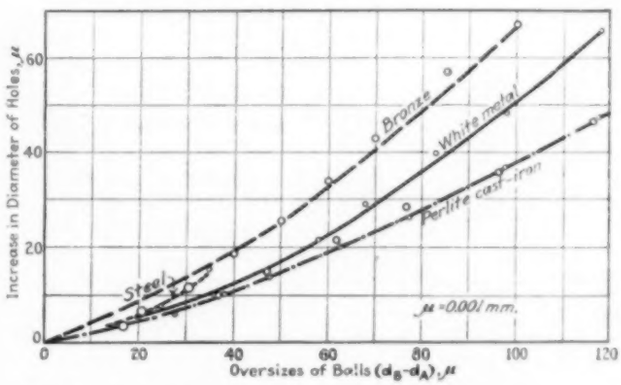


Fig. 2—Increase in the diameter of the holes by pressfinishing increases rapidly with increase in the oversize of the ball. By oversize of the balls is meant the difference in diameter of the ball D_B and the diameter of the hole D_A, both before pressing

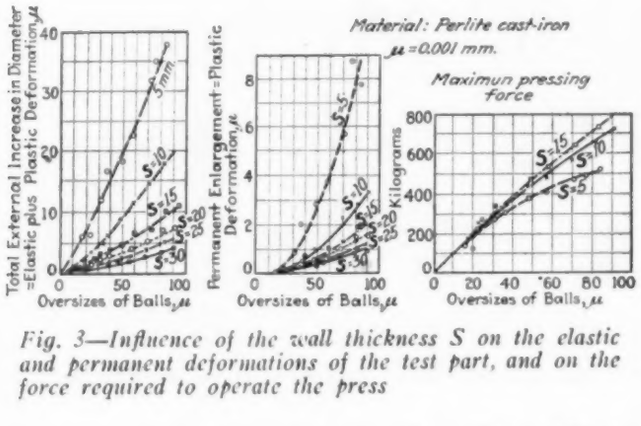


Fig. 3—Influence of the wall thickness S on the elastic and permanent deformations of the test part, and on the force required to operate the press

used in the shop, never larger than about 0.02 to 0.04 mm., as prescribed by the firm which delivers the balls.

Also, it must be concluded that the operation of reaming holes cannot be eliminated by the pressfinish method. On the contrary the holes should be reamed after drilling with the most precise tools and machine to obtain a nearly exact geometrical form. The pressing through of the balls, the last phase of work, will give the holes maximum refinement and precision.

The differences of diameters are shown at the right in Fig. 4, as measured with a "no go" test gage. In the diagram the upper lines of the fields correspond with the maximum diameters, the lower ones with the minimum diameters, of the hole. The gradual decrease of the differences of the diameters will be seen. The differences sink from 0.066 to a value of 0.021 mm., by the pressfinish method, so that the sizes of the holes are finally between the limits of the precise fits of the German DIN tolerance system.

It was surmised that the ball while passing through the hole would not move quite rectilinearly, but that its movement would be slightly curved, due to giving way to hard points on the walls of the hole. For examining this motion, and the result on the geometrical form of the hole, some of the test parts were cut through the center. They were fixed on the slide of a Zeiss length-comparator, the accuracy of which was controlled by a Zeiss interferometer. The contact-pins of a Hirth-minimeter were slid on the measuring side of a gage block, and the pins of a Zeiss optimeter were slid on the

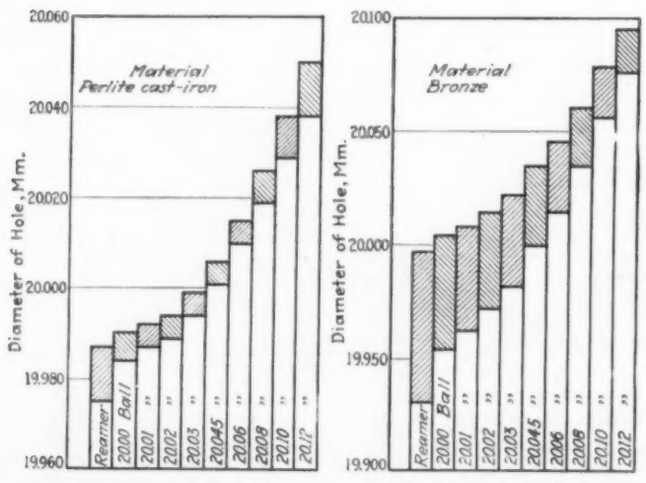


Fig. 4—Maximum variations in the diameters of holes after finishing with balls of increasing sizes

surface of the hole. Both of the instruments, as shown in Fig. 5, were used in a vertical position. Each deviation from the straight line was shown by the hands of the instruments. The gage block served as controller of the precision of the movement of the slide.

In Fig. 6 are shown the readings of the two instruments, as ordinates depending on the motion of the slide. The "resulting curves" show the real profile of the surface of the hole of the test parts greatly exaggerated. An unusual number of balls, the whole set of nine, was applied. Although the profile of the reamed hole is better and more rectilinear than that of the reamed and press-finish hole, the deviations are very small, about 0.003 mm., max., and the form and size of the hole are between the limits which are prescribed for most precise fits in the German DIN tolerance system. Of course these deviations will be still smaller, if only two or three balls were pressed through the holes.

The quality of the surface of metallic work is always of considerable interest. Therefore, the surfaces of holes as produced by different processes were tested by a method given by Thomas *(Engineering,* Oct. 12, 1923, pp. 449 and 483). Casts of a special gelatine were taken from the surfaces of the parts. These casts contain all the finest imperfections remaining on the surface from working, mostly small grooves and ridges the direction of which is nearly parallel to the axis of the hole.

A great number of holes were produced by drilling only, by drilling and reaming, and by pressfinishing, and in different materials. Photographs of the casts showed

Quality of Finish Produced by Various Methods

Operation	Material	Approximate maximum height of the grooves in μ (1 μ = 0.001 mm.)
Drilled	Steel	30
	Steel	20
	Perlite cast-iron	45
	Bronze	12
	White metal	10
Drilled and reamed by machine	Steel	8
Drilled and reamed twice, finally by hand with great care	Steel	5
Drilled and reamed twice, last operation by hand	Steel	6
	Perlite cast-iron	12
	Bronze	5
	White metal	5
Drilled, reamed and press-finished	All materials	1 to 2

that the unevenness on the surfaces of the drilled holes is very much diminished by reaming and that the last grooves remaining from this operation disappear by pressing balls through the holes. The result of measuring the height of the mountains and valleys of the grooves is given in the accompanying table. The holes, after careful reaming and pressing by balls of correct oversizes, have high polished surfaces which cannot be obtained by ordinary internal grinding.

Further, the wear of the balls was tested. It was observed that the polish of the ball surface became dull and damaged, particularly with hard materials and in applying balls of too large an oversize. It was found that this wear of ball surface appears especially when

several balls of increasing diameters are used. Probably this depends on the hardness of the walls caused by the pressfinish method. However, the wear of the surface can be diminished by using balls of the prescribed oversizes, not exceeding the limits of 0.02 to 0.04 mm., as mentioned above.

It was of a particular interest to measure the increasing hardness of the walls of the holes effected by the pressfinish method. A pendulum tester of a special form was built, the duration of whose oscillations is a measure of the surface hardness of the test part. Tests of different materials with a Herbert pendulum hardness tester, were compared with this instrument. Good agreement of the results was found, and no differences were found when the pendulum was applied to flat or cylindrical surfaces.

An increasing number of balls was pressed through eight holes of the same diameter in mild-steel test pieces. The holes were cut through the midst, and the hardness on the surfaces was tested by the pendulum and by the Brinell method.

In Fig. 7 are shown the results, the pendulum results being converted to Brinell readings by the methods of Benedick and Christiansen, and of Pomp and Schweinitz. It will be observed that the hardness at the center of the holes is always greater than the hardness near the borders of the holes.

Some of the test parts were also tested after each pressfinish operation, the hardness being measured by the pendulum, at the center and near the borders of the hole. By this instrument it was found that the hardness of the walls of the holes increases about 50 per cent referred to the hardness on the surface of the reamed hole. Such cold-hardening was observed not only with steel, but also with cast iron and bronze.

The prescribed limits of the oversizes of the balls must never be exceeded. Applying balls of larger oversizes causes conical widening of the hole, the diameters increasing from the center to the borders of the hole. Special tests for measuring the deviations of the holes from the geometrical form, show that the movement of the ball is not quite rectilinear. The holes which are reamed only are superior in this respect to the pressfinished holes. However, almost all of the latter were in correspondence with the fits of the most precise quality of the German DIN system.

It was found that the quality of surface of the pressfinished holes is better than that of those reamed only.

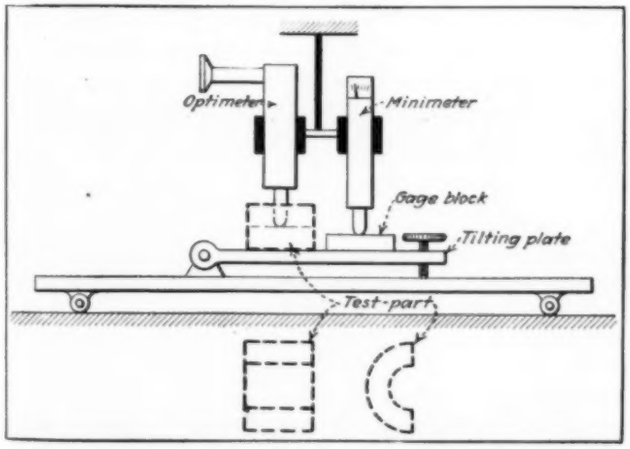


Fig. 5—Test set-up used to measure deviations of the surface of the hole from correct alignment

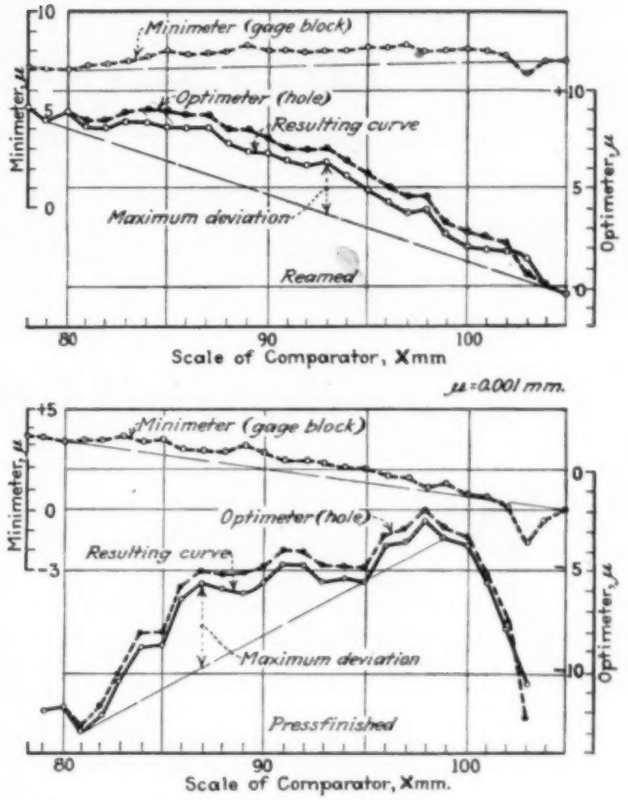


Fig. 6—Comparison of the profile of a reamed, and a reamed and pressfinished hole, in mild steel

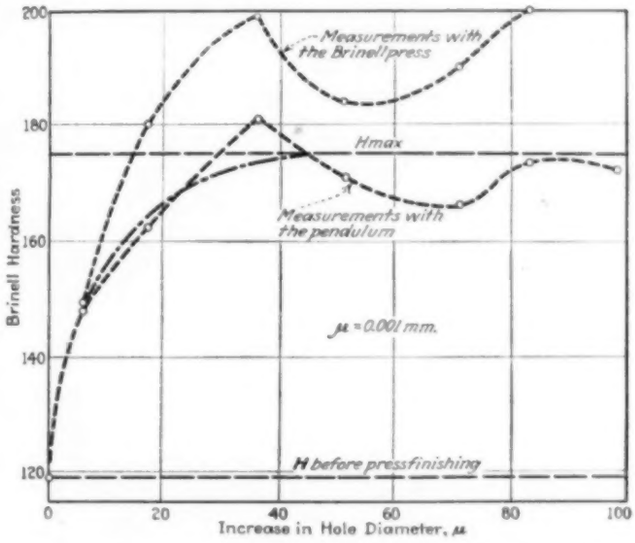


Fig. 7—Effect of increasing oversizes of balls on the hardness of the surface of the hole

The walls of pressfinished holes are as smooth as a mirrow, and thus of a better polish than those produced by internal grinding. It was observed that the surfaces of the pressfinished holes were damaged, if balls of inadmissibly large oversizes, and particularly, if several balls of increasing diameters were used. Of course, by working with hard materials, the balls wear faster than when working with soft ones.

Finally, it may be mentioned that the pressfinish method has been introduced in different shops of German industry, particularly those of the German railways, and that good results are experienced in applying it.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

More Responsibilities for the Foreman

"WILLIAMS is sure going strong after the spoiled work, Al," said Ed, as they came out of a foremen's meeting in the super's office. "Wonder if he had in mind those spoiled shafts of Pete Wormser's that I told you about the other day?"

"It did seem to fit into his remarks, Ed. I hate to be an I-told-you-so guy, but you remember I said that the sub-foreman should have watched the first piece."

"But I don't just fancy watching every man, Al. He ought to know how to do a good job himself. His dope about being dead sure that the first piece is right is old stuff. Don't see why he wants to post it as a rule."

"Of course it is. But if you'd made sure Wormser's first piece was right, he wouldn't have spoiled the shafts. I don't like a mess of rules any more than you do. But it may be the only way we'll remember to watch first pieces.

"One shop I know has another rule that isn't bad. It's something like this: 'If a blueprint is so dirty that you are not sure of all the figures, ask the foreman for a new print.' They figure that it is cheaper to make a new print, and lose a little time, than to spoil work. They want all cases of doubt put up to the foreman, or sub-foreman, whether it's the machine set-up, the blueprint, or a poor tool."

"Always adding to the foreman's worries, Al. Don't we have troubles enough without putting everything up to us?"

"I know we have a lot of worries, and some of them could probably be shifted elsewhere. But if there's any job that belongs to the foreman it is getting work out right, without spoilage, and on time. If anything else interferes with these functions, he needs help from somewhere else. I'm not any more keen on taking on more trouble than you are, but I think Williams is right in putting it up to us to prevent mistakes."

"They better give us some better mechanics then. You know the kind we're getting lately."

"That's another story, Ed. We may not be able to get hundred percenters—and we never will—but we can pay more attention to first pieces, and smudgy blueprints, and poor fixtures, even if we neglect something else. It's up to us to impress on the men that they must come to us before going on with a job, or if the blueprint isn't clear or the fixture isn't right. They'll be glad to do it if we treat them right and don't bawl them out when it isn't their fault."

Is Williams wise in insisting on the foremen checking first pieces, blueprints and fixtures? Or is this a job for someone else —and who? Is Al right in thinking these are the foremen's most important duties?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Should the Men Support Their Own Club?

NOMINAL charges for the use of pool tables and bowling alleys are the only expenses which the employees will carry in the new service building of The Yale & Towne Manufacturing Company. Funds for the erection and endowment of this building were provided through a special bequest in the will of the late chairman of the board, Henry R. Towne.

The Georgian exterior of the building is of Colonial brick, trimmed with Indiana limestone, and the lobby is of marble. There are two stories and a basement. The main floor houses the works hospital, dental clinic, and

industrial relations bureau. The second floor has a large auditorium, gallery and stage, with a seating capacity of 400. The library is located on this floor. The auditorium will provide a meeting place, and recreational and dramatic center for the various plant organizations. A motion picture outfit will be installed for entertainment.

In the basement are four bowling alleys, and a gallery for spectators at the end of the hall. Two pool tables are installed in one section of the basement. The cost of construction of this building, and the sum necessary for its maintenance, total approximately half a million dollars. —H. C. RAHM.

Making Foremen—or Importing Them

WHEN a man from the shop is given a position as foreman, there should be no reason for doing much fussing with him. This case appears to be one of a bad choice, or it is an unusual shop that does not contain at least one man who has possibilities. While it must be admitted that Williams should be commended for his consideration of the men, I doubt if importing a foreman has such dire results as Al believes. Furthermore, an outside man usually comes in, not only with new ideas, but also with a desire to improve his past record. With the coming of an outside foreman, each man in the department starts with a clean slate, and will be gaged by results. Therefore, it is logical that each man will have a desire to prove his worth by giving his best effort.

—WALTER W. YAEGER.

THE · NEXT · TOPIC

Letting Small Savings Offset Larger Wastes

ADVANCE QUESTION

Ed has heard of a shop where the cost of small tools, such as drills, seems to be disregarded. They don't check out every small drill, but allow a man as many as he needs for a day's work. Ed objects to it. Al thinks it might have good points. What is your experience?

Handling the Shop Office

A FOREMAN should not be troubled with office routine. The office work should be organized from the main office by an expert who knows the foreman's needs, and who can produce for him such data as direct labor costs, indirect labor costs, material costs for each job, and value of scrap, which will enable him to control his shop. A foreman's job is to get production at the lowest cost, and he should not be hampered with office routine. He is employed as a specialist on his particular job. By relieving him of office routine he can devote the time to improved and cheaper methods of production, and organize his shop for maximum output.

—H. NORMAN, *England.*

Letting Good Men Get Away

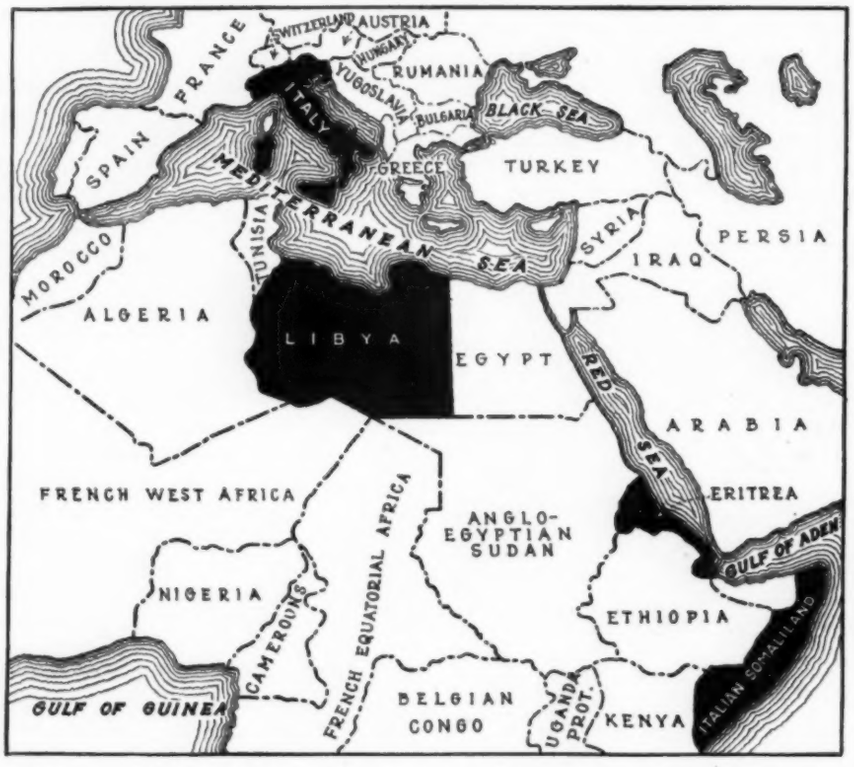
UNLESS he knows definitely that he can fulfill his promise, a foreman is foolish to hold a good workman solely by promises of advancement. There are many other ways of retaining men. The foreman who tells his men when they have done a good job, who gives them the feeling that their work is appreciated, and does all he can to get them increased rates, will find it easy to retain them. At the same time, he should encourage those who have prepared themselves for supervisory jobs by calling the attention of the management to their qualifications. Changes of personnel, increased business, and other causes are constantly opening up new opportunities for the ambitious worker and it is quite possible that a place can be found in some other branch for the worker who deserves promotion when there is no opening in his own department. —A. R. KLING.

The New Roman Empire of Business

By JULIUS KLEIN
Director, U. S. Bureau of Foreign and Domestic Commerce

Italy is now a first-rate power in the business world, and is pushing her trade aggressively with South America and the Mediterranean World

TO THE casual reader of the daily press, the mention of Italy brings to mind the most spectacular, picturesque figure in Europe, Mussolini. But the association is apt to be only with the striking details of his personality and that of his régime—the fantastic revivals of old Roman imperial emblems and gestures, of many of the glorious relics of the remote past. A careful scrutiny, however, reveals a far deeper significance to all of these surface manifestations. The new regime has certainly accomplished far more than merely the resurrection of certain old Roman practices and trappings. It has made sufficient progress in these past few years to rouse the interest of every intelligent observer of international business. Its program is fraught with importance, not only to the renaissance of Europe as a whole, but also with reactions upon our economic and commercial affairs in numerous vital respects.



The possessions of the new Roman Empire (shown in black) are largely in Africa, and particular emphasis is being laid upon the commercial development of near-by Libya

Italy is by no means any longer to be regarded as a secondary power in the field of European business. She is emphatically among the first group. The acceptance of her status in this respect is typified by the recent election of Alberto Pirelli as president of the International Chamber of Commerce. He is thoroughly qualified in every respect to take rank among the business leaders of the world, with many of whom he is on terms of intimate, personal acquaintance.

Fundamentally, the Mussolini policy, so far as its economic aspects are concerned—and it is at bottom an economic program—is the achievement of a maximum degree of self-sufficiency for the country. This stupendous task has involved a host of details, commercial, industrial, and physical. It involves the merger of all possible assets of the Italian people, not simply every scrap of native energy and natural resources in the peninsula, but also of ties overseas—emigrant remittances, commercial undertakings, international ties of aviation, cables, shipping, and the exploitation of colonial possessions in Africa.

This means, from our point of view, the possibility of competition in Latin America; it means a tightening of the bond between Italy and her sons in the New World; it means especially an intensive drive to readjust the trade balance which has long been heavily "unfavorable" to Italy, by minimizing the excessive imports and vigorously pushing her exports. This will involve the prospect of producing in Italy, or her African possessions, such outstanding items in our export trade with the kingdom as wheat, tobacco and cotton. It also involves the prospect of competition with our textile exports, possibly with automobiles, and lesser items such as shoes and hats.

The question of the "unfavorable" trade balance has long given the new régime very grave concern. In prewar years, Italy's imports exceeded her exports by about 51 per cent, their average during 1911 to 1913 in millions of dollars being 690.7 and 457.6 respectively. By last year, however, the situation had been somewhat improved, since the totals were 1,050 for imports and 805 for exports. The excess of the former was thus cut to about 33 per cent.

One vital factor in this trade balance readjustment has been the fundamental problem of strengthening the exchange value of the lira and its establishment upon a firmer basis. Its recent history has been far from stationary in contrast with the currencies of most of the rest of Europe. In 1922, its stability was 70.9 as com-

pared with the general European average of 57.9. By 1927 it had advanced only to 72.1, whereas the general European average was 95.1. The government has undertaken a series of very important measures to secure that stability which is so essential to the future development of this self-sufficiency plan. It has launched a series of measures, including the settlement of the war debts with the United States and Great Britain, a stricter control over the issuing of notes, and the strengthening of the resources behind them with a fixed minimum of 40 per cent of the circulation and a prospect of raising the figure to 89 per cent. Clearly, the policy has been courageously outlined and vigorously applied. In fact, the criticism made by the business world seems to be that it was perhaps too drastic and sudden in method of application.

de Pinedo, at the left, and the plane in which he flew from Rome to South America, and then northward to the United States. This flight was typical of Italian aggressiveness in most lines of commerce and business

One conspicuous feature of the new program is its agricultural plan, which contemplates the bringing under cultivation, forcibly if necessary, of all the potentially arable soil of the country in order to render the nation independent of the import of staple food supplies. A spectacular feature of this scheme is the "battle of the wheat" in which Mussolini is atempting to dramatize this struggle. The "battle" is not yet won; many set-backs have been experienced; but, in general, it seems to be swinging toward —if not victory then certainly not toward a serious loss of ground.

The reclamation plans of the Government are certainly of imposing proportions. They call for an expenditure of some 400 million dollars during the next 14 years, half of it to be paid by the Government and the rest to be loaned by it to land owners for thirty years at a nominal rate. These expenditures will be for drainage, irrigation, and farm equipment. The latter will, of course, be procured wherever possible in Italy, but it is reasonable to suppose that the general increase of interest in up-to-date farming methods will provide attractive opportunities for American merchants. This formidable program contemplates improvements on a total of something like 5 million acres.

In addition to this ambitious scheme, over 100 million dollars are to be spent on roads, on which it is announced more than 40,000 men will be active before the end of 1928—again, a promising outlook for better trade opportunities which American manufacturers should be able to capitalize. This will provide a complete national system of good roads, opening up many hitherto unused arable areas, and mineral resources. It will tend also to ease up the strain of urban concentration, which, in recent years, has been a serious problem.

Turning now to the commercial relations between Italy and the United States, much has been said of the supposed impairment of Italian exports to this country, either through the rise of competing industries here, or through the effects of our Prohibition Act or our tariffs. The figures, however, would seem to refute this theory since we are taking almost exactly the same proportion of Italy's total export trade today as we did in 1913. We ranked second as a market for her products just before the War, taking 10.7 per cent of her total overseas shipments. Our share last year was 10.66 per cent, which again put us insecond place, Germany being first in rank.

In point of value, our imports have more than doubled, having risen from a pre-war average during 1910 to 1914 of 51 million dollars to slightly less than 109 million dollars in 1927. In terms of percentage this is easily the best showing of growth in our imports from any European nation. Even making allowances for price changes in that time, it still represents a substantial expansion in volume.

Our exports to the peninsula kingdom have likewise doubled since 1913, having risen from 66 to 132 million—again, a record rate of increase in any of our European sales. This would certainly seem to indicate that something has happened to the buying power of the Italian people. Furthermore, it represents a gratifying increase in our share of Italy's total imports, which rose from 15.5 per cent in 1913, when we were third to Germany and Great Britain, to 19.6 per cent when we took first place in the list of countries supplying her with foreign products. Clearly, the trade relations between the two countries are in a singularly gratifying position.

As for the possible competitive rivalry between Italian and American products outside the peninsula, it happens that, so far as North Africa is concerned (an area in which Mussolini is making strenuous efforts), our trade has grown in almost exactly the same proportion as Italy's. There has been some rivalry in cottons, motors, and electrical supplies, and more should undoubtedly be expected by our dealers in these commodities around the Mediterranean, including particularly the Near East. The old racial ties with Rumania are being expanded, and Italian wares are appearing throughout the Balkans and Asia Minor—markets in which they are likely to encounter some rivalry with American goods.

Of special interest to us, however, is the Italian bond with Latin America. The diversion of the stream of emigrants from our shores to the South Atlantic seaboard of the Southern Continent is undoubtedly fraught with some commercial significance. Already, nearly one-third of the Argentine people, and over a million persons

in Brazil, according to some estimates, are of considerable Italian extraction. During the last three years, the migrations from Italy to those countries have exceeded 75,000 a year. Furthermore, there is a very heavy tide of seasonal migrations which forms a living bond between the mother country and these economically new lands, a bond whose commercial possibilities is being keenly appreciated by the Italian Government. Thousands of harvest hands make these annual trips, never knowing the hardships of winter, and they have thus become a potent force in transmitting commercial and economic impressions between Italy and Latin America.

The flight of the distinguished Italian aviator, de Pinedo, the visit of the Italian Crown Prince, and recent tours of various "floating expositions," are all parts of this program.

Italy's share in Argentina's imports has gradually risen, until today she supplies approximately 9 per cent of the total, whereas the proportions of France, England, and Germany have declined in each case. In fact, Italy and the United States are the only major commercial nations whose annual percentages of imports have shown a steady growth over their pre-war shares in most of the Latin American markets.

In volume of trade, the totals are not yet pretentious. Italy exported to Argentina, Brazil, and Chile in 1926 slightly less than 60 million dollars' worth of goods. Complete figures for 1927 are not yet available, but their trend indicates a slight increase.

Another phase of this drive for overseas markets has been the organization of a National Export Institute, a semi-official trade information service intended also to co-ordinate the efforts of banks and insurance companies in financing foreign business on economical terms. The organization also is launching a program of export credit insurance and bids fair to play an important part in this plan of a vast "Economic Roman Empire" beyond the seas.

Favorable Commercial Relations

Our commercial relations with Italy stand out in favorable contrast against those with several other major European nations in that the Italian government has put in effect no discriminations whatever against American goods. For almost half a century the trade between the two countries has been carried on under a most-favored-nation treaty, naturally Italy has granted certain preferential tariff treatment to her colonies, but that is a universal practice in which we also participate.

The general expansion of the power industry as a whole has been one of the outstanding features of the New Italy. The production in kw.-hr. has risen from about 1.9 billion in 1913 to 7.6 billion in 1926, which exceeds the rate of proportionate growth of any major commercial and industrial nation. Much of the capital used in this astonishing expansion has come from the United States. There are also heavy subsidies granted by the national government both directly and indirectly in the shape of tax remissions.

Closely linked with Mussolini's widespread road building project is the expansion of the automobile industry. Naturally he is making every effort to reserve the potentialities of the Italian automotive market for native cars, but, in spite of the 70 per cent ad valorem duty, many of our lower priced cars have succeeded in entering the trade. There are still vast possibilities for increasing the number of motors in the country even though the registered automobiles have jumped from 75 thousand in 1923 to 168 thousand in 1927. Even so, this gives the country only one car for 254 persons as contrasted with one to 5 in this country, one to 38 in England, one to 40 in France and one to 148 in Germany. For the time being, it would seem that the Italian motor industry must seek for its chief outlet abroad until the road program is advanced, but the stiffening of the lira exchange has seriously impaired this commerce and all Italian factories have been more or less in difficulties. Further organizations and mergers may be anticipated, indeed the leadership of certain Italians in proposing a Pan-European automobile cartel against the American industry is one expression of this point of view.

Other phases of transportation have been improving substantially, railway lines have gradually increased, notably being a new line over the French border especially useful for freight. The total mileage has grown from 8,500 in 1913 to 11,000 in 1927. Even more striking has been the growth in service; the freight carried in millions of ton-miles has risen during those years from 4.2 to 7.7, a proportionate growth which could not be matched anywhere else in Europe.

Air Routes Developed

Naturally Mussolini has thrown all possible resources into the development of Italy as the center of a Mediterranean net-work of air traffic—the counterpart of Germany in northern Europe in this respect. Regular services are now maintained in all directions including routes recently opened to Spain and Tripoli, as well as the older lines already functioning for sometime to Athens and Constantinople, Albania and various northern European capitals. The recent triumphs of Italian planes in various international contests and extraordinary trans-oceanic and trans-continental flights have naturally been fully capitalized, and give great encouragement to aeronautical activities.

One of Mussolini's real triumphs has been in the field of merchant shipping in which Italy stands fifth today to Great Britain, the United States, Japan and Germany, with a tonnage of 3.4 million, whereas her rank was a rather poor eighth before the war. Her tonnage has nearly trebled since 1910, and in view of the fact that most of the new vessels are of recent construction, they embody all of the latest economies and developments in marine engineering. In view of the importance of this phase of his program of Italian supremacy in the Mediterranean, it is natural that Mussolini should support shipping with an aggressive subsidy system. The total payments now exceed 10 million dollars a year and are being made to about one-fourth of the merchant fleet upon an elaborate system of aids especially to the "indispensable" lines which have an important part in his general plans for Greater Italy.

The commercial significance of these efforts are, of course, obvious. They are likely to be felt in the development of our own export trade in those waters. A series of commercial treaties is being aggressively negotiated comprising not simply the nations bordering on the Mediterranean, but even as far as the native potentates around the Red Sea. The possibilities of outlets for Italian textiles and machinery are being aggressively sought.

The radio and cable form likewise an important part of this development of ties with other lands and markets. They are invaluable links in the new political-economic strategy, especially in the New World, and in north Africa and the Near East. Two highly important trans-Atlantic cable services were inaugurated in 1925 and are likely to be further extended in the near future.

How to Handle

Depreciation Accounting

on the Books

By THOS. B. FRANK

Treasurer, Cincinnati Planer Company

WHILE the element of cost of production commonly called "depreciation" is understood by most business executives and industrial accountants, they have often been confused when considering the practical application of the theory of depreciation to their specific businesses and their own books. The will to do has not been lacking but the modus operandi of the various tools of accountancy for the proper recording of the computations has not been fully understood.

The various elements of depreciation and its definition were set forth in the previous article on this subject appearing in Vol. 69, No. 21 of *American Machinist*. Also, the various factors governing depreciation and its computation were outlined and explained. The present article deals with the methods to be used in the proper computation and recording of depreciation both for financial statement purposes and for cost records, and how these computations can be reconciled with the amounts allowable by the internal revenue laws.

First of all it is desirable that a false conception of depreciation accounting, arising from the commonly accepted interpretation of the income tax regulations, be corrected. This belief is that no business concern can figure depreciation except at the rates and on the bases prescribed by the Internal Revenue Department. It may be true as far as accounting for depreciation for income tax purposes is concerned, but why let the same prescription govern the accounting for costs of your product when it is manifest that the tax basis is not adequate or commensurate with actual economic conditions within your industry? The Internal Revenue Department is not concerned, one way or the other, as to how you keep your own records so long as your books indicate the amounts that may be used in computing taxable income. When other methods are used for cost purposes a reconciliation must be made that will set forth the difference between the method used and the one prescribed by the income tax regulations.

The theory has been explained and the detailed advantages shown for computing depreciation upon current replacement values instead of the time honored basis of original cost. It is now desirable to show how that theory may be carried into practice with a minimum of clerical effort.

Let it be assumed that proper plant and equipment records are already carried upon the books of account and record, and that they are properly classified (see Tables I, II and III on page 790-791, Vol. 69, No. 21). It is now desired to set up the current replacement values of that plant and equipment and compute depreciation on that basis.

The first step in this procedure would logically be the revaluation of the plant and equipment at current values. This could be accomplished through appraisal by an appraisal company or by the staff engineers of the organization itself. Current price quotations for most items of building construction and equipment can be easily obtained.

The figures in Table I will be assumed to be the results of the appraisal or revaluation compared with original cost, together with the rates of depreciation and the annual depreciation computations on the various bases indicated by the column headings. It will be seen that the total current replacement value represents an increase in the valuation over the old original cost figures of $149,852.25—an additional amount that must be considered when computing depreciation.

In considering all of these examples and computations it must be borne in mind that we are working with an assumed plant, built and equipped during the period

Table I—Comparison of Replacement Value and Original Cost Figures

	Cost of Acquisition	Current Replacement Values	Increase	Rate of Dep'n Per Cent	Depreciation: On Costs of Acquisition	Depreciation: On Current Replacement Values	Depreciation: On Increase	Allowed for Tax Purposes: Rate Per Cent	Allowed for Tax Purposes: Amount
Real estate	$10,000.00	$13,000.00	$3,000.00	..	.....	.....	.....	..	.....
Buildings	152,000.00	200,000.00	48,000.00	3½	$5,220.00	$7,000.00	$1,780.00	2	$3,040.00
Machinery	245,372.75	321,425.00	76,052.25	10	24,537.27	32,142.50	7,605.23	6	14,722.37
Shop equipment	75,000.00	92,000.00	17,000.00	20	15,000.00	18,400.00	3,400.00	15	11,250.00
Power house equipment	20,000.00	25,000.00	5,000.00	10	2,000.00	2,500.00	500.00	8	1,600.00
Office furniture and fixtures	3,000.00	3,800.00	800.00	15	450.00	570.00	120.00	10	300.00
	$505,372.75	$655,225.00	$149,852.25		$47,207.27	$60,612.50	$13,405.23		$30,912.37

before the rise in values resulting from the war. The reverse condition would be true if the plant was built and equipped during the period of peak prices of the war and up to the year 1920. The revaluation would indicate a decrease instead of an increase over original cost. The methods of accounting and recording would be the same, in one case recording increases and in the other decreases.

The executives of a plant built at peak prices should be just as much concerned in getting costs on a normal current basis as the owners of a plant built at the lower pre-war prices. The high priced plant has a competitive handicap and the low priced plant a competitive advantage, based on original costs. Therein lies one of the chief advantages of using current replacement values, which enable costs to be brought down to a truly comparable basis.

In Table II, entry No. 1, is shown the journal entry that would be made to record the increase in values shown in Table I. This entry adds to the recorded value of the plant and equipment the amount of the increase resulting from the revaluation at current replacement values and sets up a corresponding surplus account which is commonly called "appreciation surplus."

The next step is the recording of the periodic (in the example, yearly) charge to cost of production for the depreciation element of expense. This is shown in entry No. 2 of Table II. Note in Table I that the total valuations shown in column 2, the current replacement values, are to be depreciated at the recommended rates shown in column 4. The resulting total depreciation is therefore $60,612.50 as shown in column 6. This amount is then charged to costs of production and credited to the "Equipment Replacement Reserve." To simplify the handling of the records for income tax purposes this reserve account should provide two columns, in the first of which is recorded the depreciation based on actual cost of acquisition ($47,207.27 in column 5), and in the other the difference between the total amount of $60,612.50 based on current replacement values, and that computed on the cost of acquisition basis, which amounts to $13,405.73—column 7. This makes readily available for income tax accounting the difference that must be accounted for.

Table II—Journal Records to Show Depreciation Expense and Income Tax Reconciliation

ENTRY NO. 1			
Dr. Real estate		$3,000.00	
Dr. Buildings		48,000.00	
Dr. Machinery		76,052.25	
Dr. Shop equipment		17,000.00	
Dr. Power house equipment		5,000.00	
Dr. Office furniture and fixtures		800.00	
Cr. Appreciation—Supplies			$149,852.25
To correct values of above accounts in accordance with current replacement values			
ENTRY NO. 2			
Dr. Cost of production		$60,612.50	
Cr. Equipment replacement reserve: Cost value			
Buildings	$5,220.00		
Machinery	24,537.27		
Shop equipment	15,000.00		
Power house equipment	2,000.00		
Office furniture and fixtures	450.00		$47,207.27
Cr. Equipment replacement reserve: Replacement value increase			
Buildings	$1,780.00		
Machinery	7,605.23		
Shop equipment	3,400.00		
Power house equipment	500.00		
Office furniture and fixtures	120.00		13,405.23
To charge cost of production with annual depreciation of plant and equipment on current replacement values, and segregating the amounts based on cost and on current replacement value increase			

Table III—A Profit and Loss Statement for Income Tax Purposes

INCOME				
From sales			$472,937.22	
Less: Returns, etc.			30,124.22	$442,813.00
COST				
Production costs	$350,125.00			
Deduct:				
Over earned burden	$2,427.25			
Depreciation on replacement value increase	13,405.23	15,832.48	334,292.52	
Marketing costs			57,104.38	391,396.90
Net profit				$51,416.10

In the analysis of the accounts for income tax purposes the elimination of this item of depreciation that is not allowed by the tax laws, must be provided for upon the profit and loss statement. The procedure is simple and is handled in much the same manner as over-earned burden or overhead.

Table III shows a hypothetical profit and loss statement predicated upon the inclusion of depreciation charged to costs of production based on current replacement values. It will be seen that the production costs are computed in the regular manner except that the new values have been used as a basis for computing depreciation. On the statement the amount set aside, and determined to be the amount of depreciation on the replacement value increase ($13,405.23), is deducted from the production cost total and the resulting net profit is the amount that is reported on the income tax return.

The process is simple and the only real work involved is the determination and setting up of the current replacement values, and the original computation and separation of the depreciation on the replacement value increase. Once established it is easily carried forward.

In Table III A is shown a form of profit and loss statement that should be used by the management of the business for its own guidance. It shows first the actual profit of $38,010.87 made on the sale of the products that have been costed upon the basis of current replacement value depreciation. Secondly, it shows the management the exact amount of the advantage the business has over

its competitors by owning a plant constructed and equipped some years ago at lower prices than prevailing today. The advantage gained by such economic factors amounts to $13,405.23 in this case, which is the amount of the depreciation on the replacement value increase. The statement shows exactly what the business earned on a certain schedule of selling prices, based on current costs, and it also shows the portion of the total profit that is due to the low priced plant and equipment. The executive will not be so apt to pay out in dividends the amount of that advantage, which otherwise would be hidden in the total net profit figure. Under this method he would no doubt be more apt to hold that amount for the actual replacement of plant and equipment.

Another problem in accounting for depreciation arising from the application of the income tax laws, is that of accounting for the difference in the recommended rate of depreciation charged on the books and that allowed for tax return purposes. In the example shown the recommended general rate for the classification of machinery is 10 per cent. In some cases the Internal Revenue Department has not allowed more than a 6 per cent rate. However, this is no sound reason why the 10 per cent rate should not be used for cost purposes and for financial control of a business. The difference between the rate of 10 per cent used on the books on a cost of acquision basis and the allowed rate of 6 per cent should be set up on the statement in the same manner as the difference between the cost of acquisition depreciation and that computed on current replacement values. In other words, the amount of depreciation of $24,537.27 figured at 10 per cent of the cost of acquisition should be broken down into two amounts; 6 per cent, amounting to $14,722.37, to be reported on the income tax return, and the 4 per cent, amounting to $9,814.90, remaining in the expense account, to be eliminated on the reconcilement of the tax return as provided thereon. This gives the management all the information necessary for tax purposes as well as the data needed for guidance in controlling the business.

Table IIIA—A Profit and Loss Statement for the Guidance of the Management

INCOME			
From sales		$472,937.22	
Less: Returns, etc.		30,124.22	
			$442,813.00
COST			
Production costs	$350,125.00		
Deduct: Overearned burden	2,427.25		
		347,697.75	
Marketing costs		57,104.38	404,802.13
Profit on sales			$38,010.87
FINANCIAL INCOME			
Depreciation on replacement value increase			13,405.23
Net profit			$51,416.10

Depreciation computed on current replacement values has a distinct advantage when used from a cost angle. It enables a manufacturer having an old, low-priced plant to compute costs on the same basis as his competitor across the street, when that competitor has a new plant built in the last few years. The costs of both plants would then be on a comparable basis. When costs are on such a basis there is less opportunity for ignorant price-cutting policies and there will be less tendency toward unethical competitive practices within an industry.

Let us take one specific example that will bring out the difference in cost of a job done on a boring mill in the old, low-cost plant and the same job done on a like mill installed in the new, high-priced plant; remembering of course that the new, high-priced plant is the one that of necessity is valued at current replacement values. The cost of the mill before the war will be assumed to be $10,000, and the cost today, $22,000. The annual depreciation at 10 per cent on the older mill will be $1,000 and on the newer machine, $2,200. The average working capacity of the mill is 48 hours per week or 2,496 hours per year. It is also assumed that the mill is being used to only about 65 per cent of its capacity, making an annual run of 1,622 hours. The rate of depreciation per hour on the low-cost machine is therefore approximately $0.62 and on the like high-priced machine it is $1.35 per hour. On any job being done on these mills, say of ten hours, there is a difference in cost due to depreciation alone amounting to $0.73 per hour or a total on the ten-hour job of $7.30. In actual practice, of course, other elements of burden or overhead would be added, together with the wage rate of the worker. For the sake of simplicity it will be assumed that the figures shown herewith are the total costs of the job, because the actual difference in the costs between the two plants remains in the same proportion after the other elements of total cost are included.

If selling prices are based on the costs, allowing a reasonable margin of profit, say of 20 per cent, the job done on the old machine would be sold for $7.44 and the job done on the new machine for $16.20. Certainly an element of cost that can distort cost figures to this extent is worthy of considerable serious attention. After all, isn't it the present-day prices and present-day conditions that every business man has to face? Isn't it present-day economic factors that are affecting your company? Why continue to be governed in the setting of company policies for the guidance of shop executives and the general management by figures that are not based on present-day conditions?

The accounting devices used to record this information are simple, and the facts obtained thereby are certainly worth the small amount of effort and expense necessary to obtain them. Many of the most progressive businesses of this country are now computing their costs using current replacement value depreciation and have found it to be of unusual value to them. Possibly the fact that they are progressive and successful is the result of obtaining such facts and knowing what they are doing.

Applying Flux for Aluminum Welding

By A. Eyles

THERE are various methods of applying the flux when making an aluminum weld. The flux may be applied in paste form to the surfaces to be welded. The parts may be heated, and powdered flux sprinkled along the joint, or the end of the welding rod may be heated and dipped into the flux, which readily adheres to it in a thin film.

In some welding shops a suitable container is filled up to near the top with a flux and water solution, and the supply of welding rod is kept in this. Sufficient flux will adhere to the rods when they are withdrawn for use.

Babbitt Bearing Practice in the New B.M.T. Shops

By Clarence W. Squier
Associate Editor, Electric Railway Journal

Methods and equipment that save time and secure good results in keeping cars in operation on a busy road

PRACTICE on many electric railways is to determine the period between general overhauling of rolling stock by the length of time that bearings can go without renewal or repairs. At one time, they were a limiting factor in fixing the overhauling period on the Brooklyn-Manhattan Transit Lines. Now, by the use of bronze bearings with a thin lining of babbitt, by fitting each bearing to its axle or shaft, and by use of perfected methods and equipment in the bearing department, overhauling periods have been lengthened until the bearings are no longer a factor. The two-year period between overhauling of the railway's subway cars, considered as the maximum time that the car bodies should go between painting periods is the present measure for intervals between general overhauling Bearings, to be repaired, are delivered to the babbitting department in the Coney Island shops by electric trucks. They are first carefully cleaned and are then taken to an oil-fired drying furnace, Fig. 1, which is kept at a temperature of about 600 deg. F. From the drying furnace, the bearings are routed to single-pot melting furnaces for melting out the old babbitt. One of these furnaces is shown in Fig. 2. The babbitt thus removed from the bearings is skimmed of all dross and refuse, and is then run into molds of convenient form for future use.

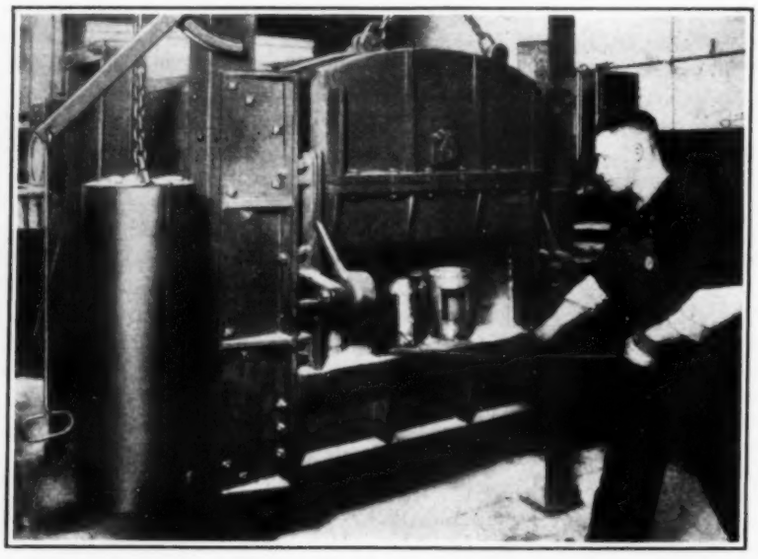


Fig. 1—The drying furnace used prior to melting out the worn babbitt

From this point, the bearings are taken to a tinning furnace which contains half-and-half solder. The inside bearing surfaces are swabbed with a flux to help pick up the tinning coat while the outsides are coated with whiting to prevent the solder from sticking where it is not desired. The bearings are then dipped in this furnace, which is illustrated in Fig. 3, and are left there until they are so hot that the solder will run off readily.

After tinning, and prior to the babbitting operation, the bearings are kept hot in order that the babbitt pouring operation, which follows, can be carried out successfully. The babbitting jigs and mandrels are also heated before the babbitting is started, but once the operation is under way, it is unnecessary to return them to the preheating furnace.

The babbitt linings are poured with the bearings in a vertical position with mandrels in place, and of correct size to leave $\frac{1}{8}$ in. for boring out. The mandrels are dipped in an emulsion of fire clay after every fourth pouring to prevent them from sticking and to guard against the formation of blowholes. The babbitt consists of ten parts of tin, one of antimony, one of copper. Ladles of the self-skimming type have been selected for the work. A bridge extends over the front portion of the ladle and a screen is placed below this bridge to extend down from the lip so that the molten metal is taken from near the bottom. The pouring is done at a temperature between 800 and 850 deg. F. A 30-ton hydraulic forcing press, Fig. 4, is used to remove the mandrels after the babbitt has cooled.

After the bearings are babbitted they are taken to the trimming table, Fig. 5, where the fins, burrs, and excess metal are removed with a hot iron. Chipping is avoided, because of the danger of loosening the newly poured lining. A small oil furnace keeps the trimming iron hot.

The next operation on the journal bearings is that of filing off all of the lumps and burrs from the bronze shell. The check plates are then fastened on with a pneumatic riveter and the bearings are taken to a motor-driven wire brush, Fig. 6, where the inside surfaces are polished.

Each bearing is fitted to the particular shaft for which it is intended, so the final boring out is not done until the bearings are returned to the truck and motor repair sections of the shop. When this boring out is done, a clearance of 0.003 in. to 0.004 in. per inch of diameter is allowed for a running fit.

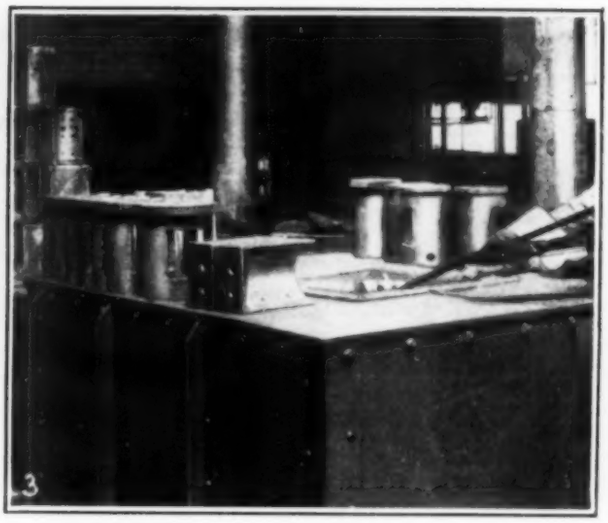


Fig. 2—Oil-fired melting pot. Here the old babbitt is melted out and run into molds. Fig. 3—The furnace used for tinning the shells prior to pouring a new lining

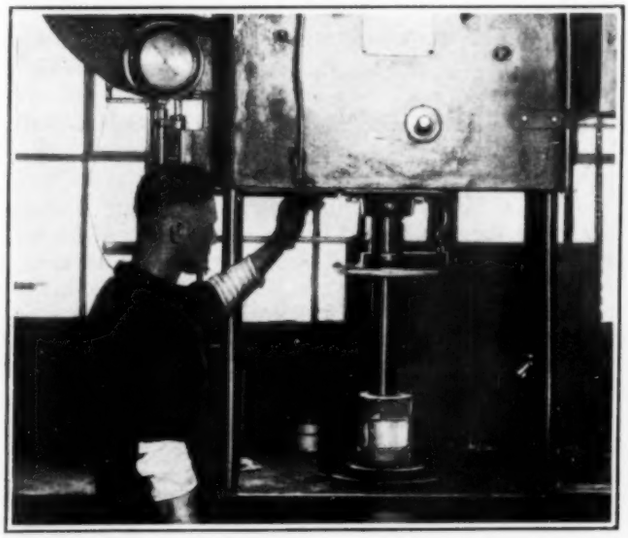


Fig. 4—Hydraulic forcing press used to press mandrels out after the bearing is poured

Journal bearings ordinarily show very little outside wear. Armature and axle bearings, however, are subject to this wear, and they are, therefore, tested carefully with snap gages, Fig. 7, as they come in to the babbitting department. No labor is put on those that show more than 0.017 of an inch of wear.

A system has been installed for keeping track of the babbitting jigs and mandrels. Each part is numbered, and is kept in a definite location on storage shelves, as shown in Fig. 8. A large board, occupying one side of the room, contains a tabulation showing the various mandrels, bases and bands which should be used for each particular type of bearing. Several columns in this tabulation show type of motor; particular type of bearing which is to be babbitted, such as commutator end or pinion end; the material that is to be used for the bearing shell; the numbers of the various broaches to be used; the numbers of the mandrels; and the numbers of the bases. Thus, if a commutator end bearing for a GE-248 motor is to be babbitted, the workman uses the mandrel and base shown to be correct. This method reduces the number of the various parts and makes it easy for the workman to select the proper unit.

A good deal of care is exerted to maintain exact records of furnace temperatures in the various furnaces, all of which are equipped with pyrometers. Charts on these pyrometers are removed at the end of each working day. New charts are put on each morning at 7 o'clock. When

Fig. 5—Removing burrs and excess metal with a hot iron from the newly poured bearings

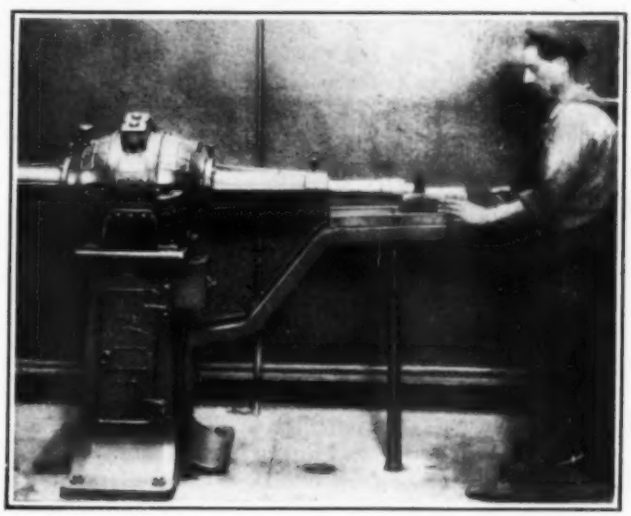


Fig. 6—This motor driven wire brush polishes the journal bearing shells in preparation for tinning

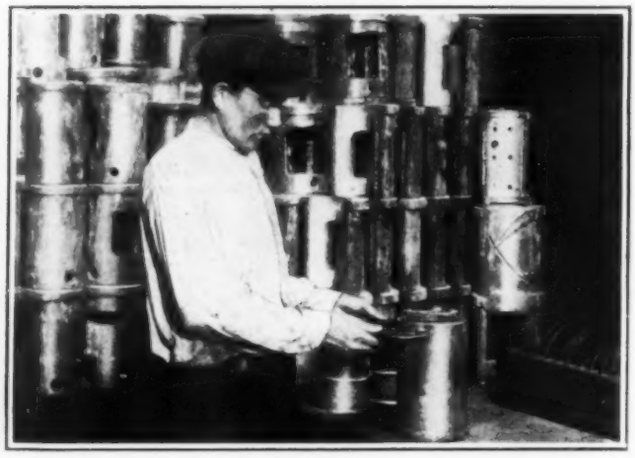


Fig. 7—Inspecting armature and axle bearings to discard those that show excessive outside wear, before rebabbitting

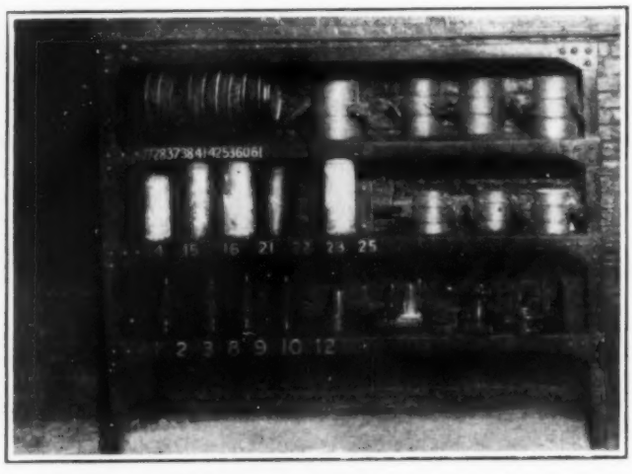


Fig. 8—The mandrels and jigs are kept in an orderly manner

Fig. 9—Loading rebabbitted bearings for the repair shop in trucks that can be locked

the chart is removed, it is given a record number, is dated, and is signed with the initial of the foreman and the number of the furnaces.

Particular care is exercised in the handling and transportation of the bearings from the babbitting room to the department where they are fitted. Sheet steel trucks, as shown in Fig. 9, are provided with covers which are locked when the trucks leave the babbitting room. They cannot be unlocked until they reach the fitting room.

Men Over Fifty—*Discussion*

By Entropy

THERE appeared an editorial on page 70, Vol. 69, of the *American Machinist* concerning men who have passed the half-century mark. There has also been a good deal of subsequent discussion in various issues of the paper.

Now, as I read history, the "young man" began to show himself in business directly after the close of the Civil War. Up to that time it was apparently believed that length of beard denoted depth of brain. Beardless youths won the war, as they have won every long-continued contest. Then came the use of electricity for light, and then for power, and, while the pioneers were by no means children, the young men took it up while their seniors were wondering what it was all about. The automobile pushed a few more older men into the discard. Now, we do not believe that a man over forty can possibly understand radio, and we may expect any day to see that Lindy is too old to continue in the flying game, and has been elected chairman of a board, or pilot emeritus, or something of the sort.

The Metallurgist Can Help Production

By A. S. Walker

PRODUCTION men, in general, have only a vague idea of the part played by the metallurgist in increasing or maintaining production. Most of the work performed by the metallurgist is behind the scenes, and in the final product there is little visible to show his activities. Occasionally, he may come into prominence when some particular problem relating to material has baffled the process investigation department, and as a last resource the matter is referred to him. To many, his knowledge is considered academic and outside the laboratory he is regarded as impracticable. A large number of production troubles can be traced to this view, for should he be asked to attempt the impossible, as is frequently the case, and express the opinion that it cannot be done, he becomes discredited.

The New Responsibility—*Discussion*

By Gus Haessler

THE editorial entitled "The New Responsibility," published on page 666, Vol. 69, of the *American Machinist*, seems to me to broach a subject sufficiently important for wide discussion. It is encouraging to note that there are some enlightened employers who will not hire men from other parts of the country when they know that their rush is only transitory. Too many managers in their zeal to increase production violate the rules of good management, and lose sight of the fact that the chief responsibility for reducing and preventing unemployment rests upon their own shoulders. Keeping toolmakers on night shifts, eleven hours, six times a week, permitting men to work four and five hours into the night schedule, after having worked through the day, and hiring men from many miles away, for temporary employment, indicates the sort of management that is rapidly disappearing. Companies resorting to such practices are inviting labor troubles, and are developing inefficiency in the whole economic organization.

IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

A Slide-Rule Chart

By L. Coon

The slide-rule chart, parts of which are shown in the illustrations, is for quick reference by draftsmen, machinists and stock and tool clerks. It is made in two parts mounted on manila paper and varnished for preservation in handling. The envelope is made as shown in Fig. 1, and is open at both ends so that the slide can pass through it in either direction. Near each end is a slot through which the figures on the slide can be read. The slide, Fig. 2, contains all the necessary figures to correspond to the reference letters representing dimensions in the drawings on the envelope.

The method of use is as follows: To find the various dimensions of a ½-in. hex-head capscrew, move the slide to the left until the fraction ½ appears through the left-hand opening. The number of threads per in. and the dimensions of the different parts will be found opposite the letters from *A* to *F*. The thickness of the piece held down and the distance the screw projects into the holding piece will be found opposite the letters *G* and *H*. In addition, the size of dowel pins to be used in conjunction with ½-in. screws, the sizes of tap and body drills, the dimensions of fillister-head screws and the dimensions of counterbores, are all given opposite the appropriate letters. When figures to be found beyond those indicated by the letter *N* are wanted, the slide should be moved to the right until the fraction ½ appears through the right-hand opening.

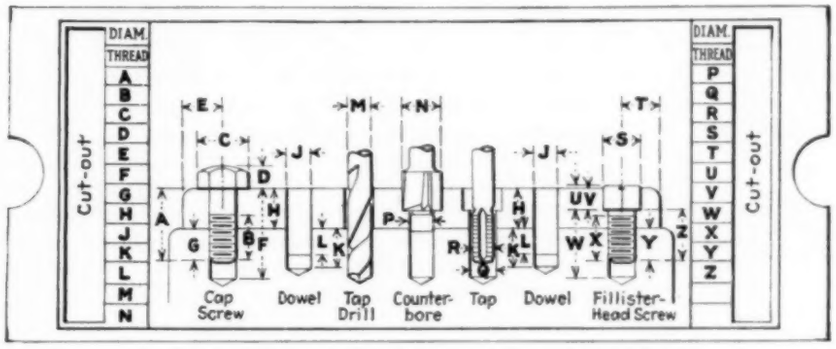


Fig. 1—The outside of the envelope when folded

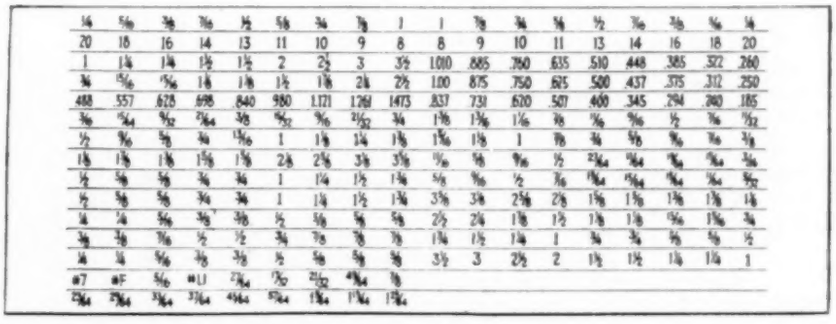


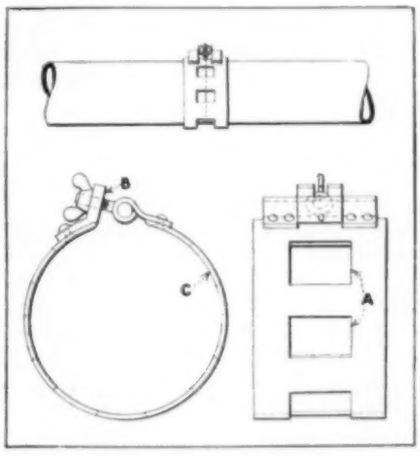
Fig. 2—The slide

Alignment Clamp for Pipe Welding

By I. E. Hindman

In my capacity as assistant plant engineer, I have many pipe lines to keep in repair and replace. The thickness of this pipe varies from 10 gage to ⅜ in., and the diameter from 12 to 36 in. It is fabricated in lengths of from 4 to 6 ft., and afterwards welded into lengths up to 30 feet. Aligning the pipe and matching the edges accurately caused considerable trouble until we conceived the idea of the flexible clamp shown in the accompanying illustration.

One size of clamp was made for each size of pipe. It is flexible enough to spring over the pipe, and when properly drawn up holds the two lengths in alignment. Openings are provided at *A* for spot welding at several points around the joint, after which the clamp is removed.

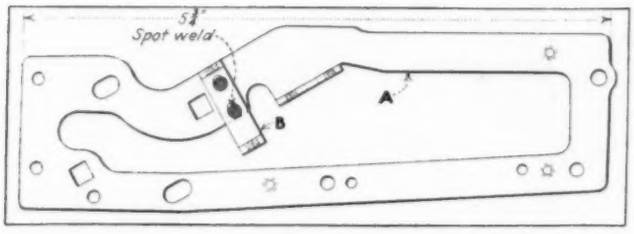


Method of aligning pipe joints

Spot Welding in Place of Riveting

By J. S. Browne

Welding is being employed extensively on typewriter and similar machine work to replace riveting. In the accompanying illustration the base side of a portable typewriter, *A*, formerly had the support *B* riveted in



Spot welded typewriter parts

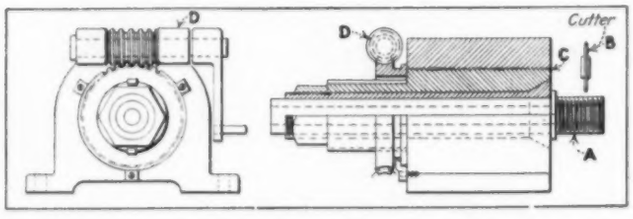
the position shown. The present method is to pierce the same two rivet holes in the side, and to punch the corresponding holes in the support only part way through. The welding operator assembles the two pieces, locating by placing the projecting punchings into the pierced holes in the base side. The punchings thus act as dowels. The support is held in place with the hand while the two spot welds are being made.

Fixture for Milling Threads on a Milling Machine

By W. L. Romick

In a case where it was required to cut threads on a number of spindles the work was first assigned to a lathe. It was found however, that the threads were rough and unsatisfactory, and the operation was slow. It was decided to change over and mill the threads on a milling machine with a single thread cutter.

The fixture shown, was designed to hold and revolve the work against the cutter. The work to be done is



Fixture for milling threads with a single thread cutter

shown at *A*, and the cutter that was used, at *B*. Since the thread *C* has the same lead as the thread to be cut at *A*, it is evident that a correct thread will be cut regardless of the rate of feed.

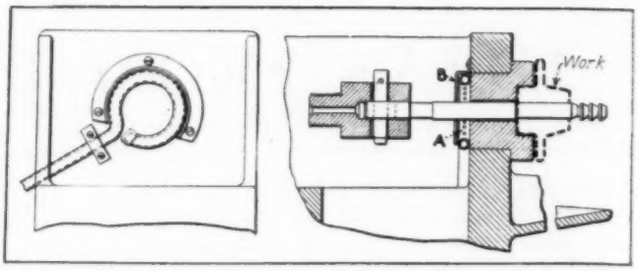
The work is held in the fixture by a draw-in collet, and the fixture is bolted to the machine table at an angle corresponding to the helix angle of the thread to be cut.

Removing Chips from Broaches

By H. C. Kling

A cleaner that utilizes the same liquid as is used for coolant can be made to remove chips from pull broaches by attaching a small pump to the machine and directing pressure streams against the tool as it leaves the work.

The device is made from a piece of ordinary pipe bent in a circle with several small holes, *A*, drilled around the inside. This is fastened to the rear of the work bushing plate, and held by a thin sheet metal shield *B*, which prevents splashing. The liquid is drawn from the machine reservoir and pumped through the small holes with enough force to knock off the chips.



Spray pipe for cleaning broaches

Some broaching machines have small pipes to pour compound on the tool at this point, but as this liquid is pumped at low pressure it does not remove chips that are stuck. In machines of this type, good results can be obtained by inserting a pump in the line to boost the pressure, and by flattening the nozzle so as to get a thin stream which will strike most of the broach.

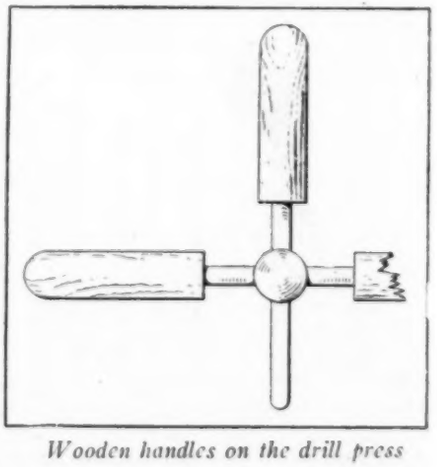
Wooden Handles for the Drill Press

By Donald A. Hampson

In a Detroit automobile plant there is a row of 20-in. upright drill presses that have been made more productive by the simple means shown here.

Originally, the work was done through the medium of either the power feed or the hand wheel that moves the spindle through worm gearing. But the return of the spindle and all the other idle movements were made by use of the capstan handles on the end of the feed pinion shaft, as is the usual practice.

These capstan handles are extremely convenient. Through them, the spindle is raised well out of the way for clearance. When the work is set, the handles are used to close up the clearance gap before the feed is engaged; and when holes are drilled to scribed circles, these handles are often the best medium for drilling the trial depressions. Time study extending over a considerable period showed the management that there was more time lost in changing from the capstan to another feed than in any other part of the work. This included fumbling with the several levers, and the time for the drill to feed to the work. It was found that greater leverage on the capstans gave all the power that was needed, and eliminated the lost time. The same position that was used for the idle movements was maintained for the cutting, without any go-betweens to waste time.



Wooden handles on the drill press

Pieces of tubing slipped over the capstan handles served for trial purposes. But for all-day working, something more comfortable to grip was necessary. To this end, the machines were equipped with hardwood handles of the length found best for the work.

Standard Classification of Iron and Steel Scrap

(Continued from Sheet No. 40a)

No. 2 Busheling. Cut hoops, netting, sheet, and similar material lighter than No. 12 gage. No dimension is to be over 8 in. It must be free from hard steel, cast, malleable, and galvanized or metal-coated material. It is for use in the basic open-hearth furnace.

No. 1 Selected Rail Scrap. Standard sections, T and guard rails, 40 lb. and heavier per yard, and less than 36 in long. It must be free from frog and switch rails not cut apart, and to contain no manganese-steel scrap or cast welds or attachments of any kind.

Baled Sheet Scrap. New, black sheet-steel clippings, shearings, skeleton stamping scrap, side and end sheet and tin-mill scrap, machine baled into angular packages, tied with wire or bands, or sufficiently compact not to come apart in handling with a magnet. Not over 24 in. longest dimensions, and weighing not less than 45 lb. per cu.ft. It must be clean and free from excessive rust, paint, or protective coating, and from de-tinned scrap, electrical sheets. No material over 0.50 per cent silicon will be accepted.

Hand Bundled Sheet Scrap. New, black steel clippings, shearings, skeleton stamping scrap, side and end sheet and tin-mill scrap, securely tied with not less than two wires or bands, in packages not over 18x18 in. by 3 ft., weighing not over 125 lb. It should be bundled so that the packages will not come apart in handling with a magnet. It must be clean and free from excessive rust, paint, or protective coating of any kind. No de-tinned stock, electrical sheet nor material over 0.50 per cent silicon is acceptable.

Loose Sheet Clippings. New, black sheet-steel clippings, shearings and stampings $\frac{3}{16}$ in. and lighter, free from excessive rust, paint, or protective coating of any kind. It should be not over 18 in. wide or long, or if edge trimmings or shearings it should be not over 12 in. x 5 ft. long. No de-tinned scrap, nor material over 0.50 per cent silicon is acceptable.

Galvanized or Coated Sheet Scrap. New, clean sheet-steel scrap, composed in whole or in part of material having a coating of zinc, paint, or protective material. It must be specified as galvanized or coated scrap and classified according to the manner in which it is prepared for shipment. No material over 0.50 per cent silicon is acceptable.

De-tinned Sheet Scrap. Sheet-steel clippings or shearings originally covered with a protective coating of tin or lead and tin, but from which such foreign metals have been removed. Must be clean, contain no material over 0.50 per cent silicon, and be free from badly rusted or corroded stock.

Electrical Sheet Scrap. New, clean sheet-steel scrap, composed in whole or in part of materials from 0.50 per cent to 1 per cent silicon. Must be clearly specified as electrical sheet scrap. It is for use in the basic open-hearth furnace.

High-Silicon Sheet Scrap. New, clean, sheet-steel scrap composed in whole or in part of material over 1 per cent silicon.

Car Wheels. Solid cast-steel, forged, pressed or rolled steel car and locomotive wheels not over 36 in. in diameter. This material is for use in the acid open-hearth furnace.

Spring-Steel Scrap. Core and elliptical steel springs made of material not less than $\frac{3}{8}$ in. diameter, or $\frac{1}{4}$ in. thick. It must not be over 18 in. wide, and must be sheared to lengths not over 48 in. It may be assembled or cut apart.

Nickel-Steel Turnings. Heavy, short, first-cut turnings from nickel-steel forgings. Nickel and chromium contents are to be specified on each individual sale. It must weigh not less than 75 lb. per cu.ft., and be free from dirt and other foreign materials. It is for use in the acid open-hearth furnace.

Guaranteed Heavy Scrap. Open-hearth steel plates, structural shapes, crop ends, shearings, broken steel tires, tool steel, and spring steel. It should be not less than $\frac{1}{4}$ in. thick, other dimensions subject to agreement. It must be not over 0.04 per cent in phosphorus or sulphur, clean, free from excessive rust, and contain no foreign material. It is for use in the electric furnace.

Unguaranteed Scrap. Steel plate, shearings, nut and bolt punchings, short rails and other similar material, not less than $\frac{1}{4}$ in. in thickness, and not over 12 in. in width or length. It is not guaranteed under 0.04 per cent phosphorus or sulphur. It must be suitable for hand charging, and must be free from galvanized and coated stock, foreign material, and excessive rust. It is for use in the electric furnace.

Guaranteed Axle Turnings. Heavy, steel or iron axle or forge turnings, guaranteed not over 0.04 per cent in phosphorus or sulphur. It must contain no foreign material, and must be clean and free from excessive rust. It should weigh not less than 75 lb. per cu.ft. It is for use in the electric furnace.

Unguaranteed Turnings. Short, heavy shoveling steel or wrought-iron turnings, not guaranteed under 0.04 per cent in phosphorus or sulphur. It should contain no foreign material, and must be free from excessive rust. It should weigh not less than 75 lb. per cu.ft. It is for use in the electric furnace.

Abstracted from Simplified Practice Recommendation R58-28

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Would a Change in the Standard Morse Taper Be Worth While?

THANKS to the efforts of a special A.S.M.E. standardization subcommittee the question of what to do, if anything, about the venerable standard taper problem is being thoroughly agitated. The twist drill manufacturers see very clearly the confusion that would result, both in domestic and foreign business, during the transition period following the adoption of a new standard. They have gone on record as being against any change.

From a purely idealistic point of view, a new system of tapers in which each taper corresponded logically to all the rest would be desirable. The Morse system was intended to be that way and only got into its present inconsistent state because of the inadequacy of the measuring instruments in the early days. But the fact is that Morse tapers are about as close to international standards as we are likely to come in the near future. This being the case would consistency between the various tapers in the system be worth the cost of a change? The chances are that it would not and that the makers are justified in objecting to a change in a standard that has such general acceptance. From the economic point of view the situation is much the same as that involved in the compulsory adoption of the metric system.

When the A.S.M.E. committee sent out its questionnaire a small majority of the replies favored a change to a new system of tapers. Possibly those replying did not give the proposal sufficient thought. At any rate, two of the biggest companies that voted for a change have reversed their position and the committee is consequently going to the field again with a different questionnaire.

Those who receive the questionnaires will be doing the metal industry a service by stating promptly and positively, after careful study, whether they want to continue the present standard taper or establish a new one. As for those not included on the mailing list they have an equal opportunity to express their views. The *American Machinist* will be glad to publish them.

No Christmas Presents for Purchasing Agents

"IT IS the desire of the Jones Company that the people from whom we purchase do not send gifts at Christmas time, or at any time, to our employees at this address, or at their homes." What a biting commentary on the selling methods of some companies! In other words, please don't bribe the men connected with buying.

If every company took the stand of the Jones Company there would certainly be a drastic reduction in the December expense account of many a "high-powered" salesman. And almost all of them would take such a stand if their chief executives knew the extent to which some salesmen will go to get on the right side of a purchasing agent.

There have been, and probably still are, purchasing agents who have let it be known that such gifts would be very much in order, but they are far fewer in number than the salesmen who make the first move in this direction.

Progress Toward a Revised Calendar

WITH every improvement in business technique, with every new installation of expensive equipment to replace hand labor, with every step toward closer control of production, or sales, or finance, it becomes more and more evident that the mutilated calendar of the Caesars will not function as well as it should. What is needed is a calendar that will meet the requirements of business and industry, and at the same time do as little injury as possible to hallowed traditions.

It must not be forgotten that the present calendar was devised centuries before man had any adequate knowledge of astronomy, and that what was originally a fairly workable scheme was juggled by various Roman emperors to suit their personal fancies. They did not improve it.

Obviously, the only way to achieve calendar reform is through an international conference. Here is one subject, at least, on which there must be international standardization. Representative Porter, of Pennsylvania, has introduced a resolution proposing that such a conference be called by President Coolidge.

If the job is to be done it must be done at once because of the day of the week on which the first of January falls. Otherwise it will have to wait for almost a decade. The conference should be called to discuss the matter even if all of us are not entirely convinced that any one plan of calendar revision is better than the rest.

· SHOP · EQUIPMENT · NEWS ·

Wickes Extra-Heavy-Duty, Geared-Head Engine Lathes

COMPLETE redesign and modernization has been effected for the 42-, 48-, and 60-in. extra-heavy-duty, geared-head, engine lathes manufactured by Wickes Brothers, Saginaw, Mich. Unusually large members have been specified throughout, and ball or roller bearings have been used on all parts with the exception of the main spindle bearings, which are bronze boxes lined with babbitt. The standard bed used with each size is 16 ft. 6 in., so that work 5 ft. 1 in. long may be taken between centers on all three sizes. With the tailstock overhung, however, the distance between centers may be 5 ft. 7 in. in each case.

In the headstock all sliding gears are mounted on splined shafts. The shafts used are made of high-carbon, chrome-nickel steel, heat-treated and ground to size. All gears are of alloy steel, heat-treated and hardened. The teeth of the gears are rounded to insure easy sliding engagement. Operating levers on the outside of the headstock provide for the selection of any one of sixteen individual speeds for the spindle. The minimum and maximum spindle speeds are 2 and 200 for every size. Spindle speeds for the faceplate drive vary from 2 to 50 r.p.m. and on the direct-spindle drive from 8 to 200 r.p.m. The handwheel at the right is used for engaging or disengaging the faceplate drive, while the left handwheel operates the nut for reversing the leadscrew when cutting left-hand screw threads. Triple-geared faceplate drive is featured, and the faceplate is keyed and pressed to the spindle nose; chucks, therefore, cannot be readily applied. Faceplate jaws can be supplied extra, made of either cast iron or steel, and are adjustable upon the faceplate.

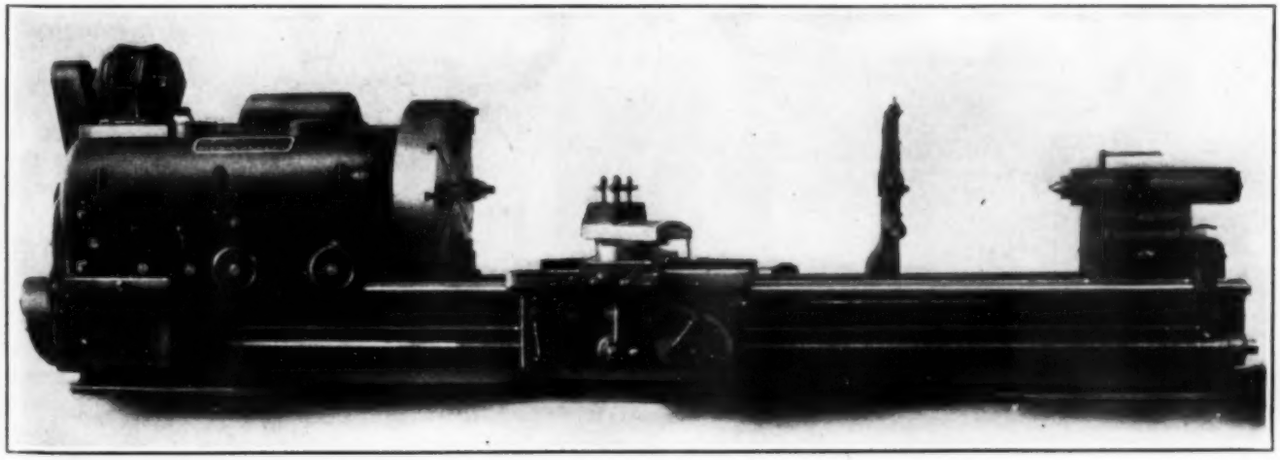
The main spindle is made of a solid high-carbon steel forging, and has its journals ground and burnished to standard size. The hole in the spindle is drilled from the solid, and is $2\frac{3}{4}$ in. in diam. Morse No. 7 taper centers are used. The headstock is filled with oil to a level, and has a sight glass gage on the front. A geared pump submerged in the oil supplies clean lubricant through piping to each bearing. The gears also run in an oil bath, which provides a splash system in addition to the pressure system.

The motor recommended for the main drive should be of the constant-speed type operating at 1,200 r.p.m., on either a.c. or d.c. Control equipment includes an inclosed reversing magnetic switch, reversing master switch, and a "start" and "stop" push-button station. The above control should also include overload and undervoltage protection. In the case of an a.c. motor, a primary resistor is also required. The motor may be mounted on the headstock or on the floor at the back of the lathe. The drive to the pulley may be either by belt with tightener, by silent chain, or by gearing.

The main drive clutch consists essentially of a driving ring with fiber inserts, an outside driving plate, an inside driving plate, and the means for clamping the friction inserts between the two plates. A movement of the clutch and brake lever at the operators' position engages the main driving clutch; a reverse motion of the same lever disengages the clutch and engages the friction brake. As the friction brake is very sensitive in its action, it is possible to jog the lathe spindle a few inches at a time, if desired.

The lathe bed is of very heavy section, cast in one piece and braced internally by double-walled cross girths. The Vs and wearing surfaces on the upper portion of the bed are of chilled, close-grained material, accurately machined and hand scraped. The feed rack is of high-carbon steel, with teeth cut from the solid, and is furnished in one piece, excepting for a long bed. As stated previously, the standard size of the bed is 16 ft. 6 in. Beds made in one piece up to 30 ft. 6 in. in length may be obtained. Longer beds are made in two pieces with the joints bolted and doweled together. The lead screw is of hammered, high-carbon, open-hearth steel, machined and threaded, and provided with ample thrust collars.

The compound rest is of very heavy construction, the swivel being fastened to the lower slide by four



Wickes Extra-Heavy-Duty, Geared-Head, Engine Lathe

bolts. The top slide is so arranged as to give a minimum of overhang at the extreme setting. The swivel is graduated for any angle up to 90 deg. Adjustable taper gibs provide ample take-up for wear. Power angular feed is provided. The carriage is very heavy, and has extra long wings, which have a bearing on the Vs for their entire length. It is gibbed both front and back, and has a wide dovetail for the cross-slide and a heavy bridge. The cross-feed screw is made of nickel steel with cut threads. Both the cross-feed screw and the compound rest screw have collars with micrometer graduations, and ball thrust bearings to take end thrust. Power-driven longitudinal traverse for the carriage as well as power-driven cross-traverse may be had.

Double-plate design is used for the apron, thus providing a support on both ends of all the gear studs. All of the gears are of steel, with the teeth cut from the solid. The studs are of steel, hardened and ground. Interlocking levers are used for engaging and disengaging the bevel pinion for the power feed of the carriage and the nut on the leadscrew.

The tailstock is sturdily built, and is of the adjustable overhanging design, which permits a wide range of adjustment at different angles of the compound rest. The spindle barrel overhangs the tailstock in the front, which permits the carriage to be moved close up to the tailstock center. A pawl and rack are provided for taking up the end thrust on heavy work. The tailstock spindle is made of steel, ground and lapped to size.

The quick-change gearbox is a unit by itself, and is mounted on the front of the lathe. All gears are made of steel with teeth cut from the solid and machine rounded to insure easy sliding engagement. Forty feed changes are provided, permitting screw cutting from ½ to 14 threads per in. The range of longitudinal feeds per revolution of the spindle varies from 0.024 to 0.723 in., while the range of cross feeds varies from 0.009 to 0.271 in. The ratio of longitudinal feeds to the threads is approximately 3 to 1. The ratio of the cross feeds to the threads is 7½ to 1 approximately.

Regular equipment includes quick-change gears, compound rest with power angular feed, large faceplate, steadyrest, thread-chasing dials, and wrenches. Optional equipment includes taper attachment, pan, pump and tubing, power rapid traverse, faceplate jaws, plain rest, full-swing rest, large-opening steadyrest, follow rest, and motor drive.

OTHER SPECIFICATIONS OF THE WICKES ENGINE LATHES

	42 In.	48 In.	60 In.
Swing over bed, in.	44	51½	61
Swing over slide on carriage and compound rest, in.	26	33	43
Driving pulley speed, r.p.m.	300	300	300
Highest gear ratio	150 to 1	150 to 1	150 to 1
Tailstock spindle diam., in.	6	6	6
Tailstock spindle movement, in.	18	18	18
Steadyrest, opening, in.	18	18	18
Oversize steadyrest, opening, in.	24	24	24
Compound rest, top slide movement, in.	17	17	17
Face plate diam., in.	43	48	60
Toolpost takes tool shank (max. size), in.	2½	2½	2½
Weight, net, lb.	41,000	42,200	45,000
Weight, each additional foot of bed, lb.	850	850	850
Power required, hp.	25 to 30	25 to 35	30 to 40
Floor space	6 ft. 3 in. x 18 ft. 4 in.	6 ft. 3 in. x 18 ft. 4 in.	6 ft. 3 in. x 18 ft. 4 in.

LeBlond Automatic Crankpin Turning Lathe

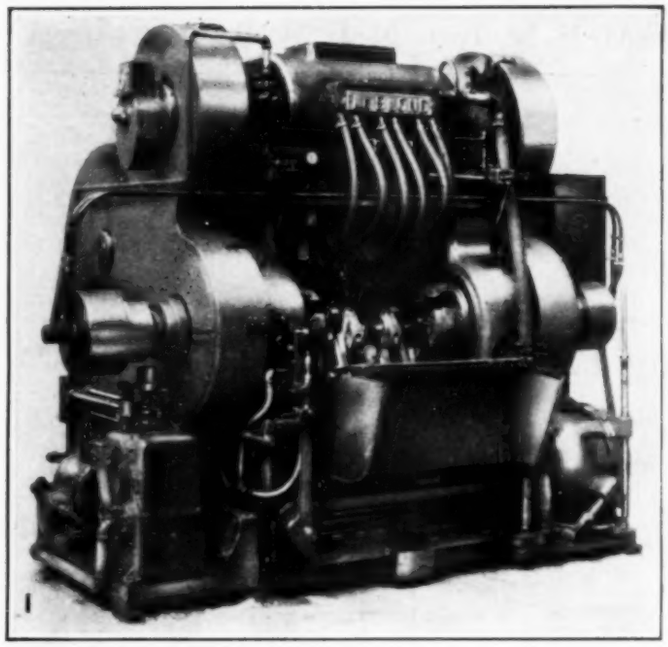
FOR cheeking the webs and turning all pins to the grinding size simultaneously, this crankpin and turning lathe has been developed by the R. K. LeBlond Machine Tool Company, Cincinnati, Ohio. The crankshafts are previously finish turned on the flange and front ends and the centerline bearings are rough ground. In Fig. 1 is shown a front view of the machine, while in Fig. 2 a view of the rear with the guards removed is given.

The crankshaft to be turned is driven from both ends by heavy, air-operated pot chucks mounted on massive spindles running on Timken roller bearings. Each centerline bearing of the crankshaft is supported by a heavy steadyrest of the full-bearing type. The steadyrest caps are clamped by an air cylinder to facilitate quick loading of the unit. The crankshaft rotates about a centerline bearing as an axis, and the tools for cheeking and turning the pins follow the movement of the throws. The movements of the tools are controlled by two master crankshafts located above and below the crankshaft being turned. The master crankshaft and spindles are driven by large idler gears placed on each side of the machine. Both master cranks and spindles rotate at the same speed and are always in phase.

Narrow ring gears are mounted on the same hub as with the idler gears and mesh with the same gears as the main idler gear does. Wear on the gear teeth and the consequent backlash between the master cranks and spindles may be taken up by changing the relative positions of the ring gears and the main idler gears. Heavy bronze plates or toolholders are supported between the throws of both master cranks. These toolholders form a rigid support for the toolslides, while the side thrust of the tools is taken by hardened steel plates bolted to the bronze toolholders.

The toolslides are arranged so that the tools feed into the work from opposite directions. The slides are coupled together by a segment gear driven by a long arm, which is connected to a hydraulic cylinder mounted on the toolholder. This cylinder controls the feeding and traversing of the tools. The oil is fed from the Oilgear system to the feed cylinder by means of a heavy link arrangement of the piping.

Vertical, bit-type tools are used in this machine, this arrangement making it possible to remove the tools for grinding and to replace them without disturbing the diameter setting of the machine. The front tool rough faces the webs and finish turns the pin, while the rear tools do the cheeking and finish face the webs. By feeding the tools simultaneously



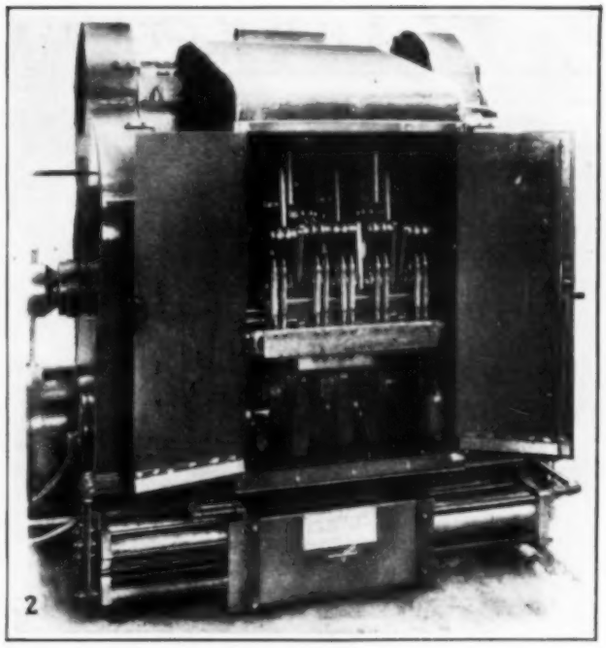


Fig. 1—Front view of the Le Blond Automatic Crankpin Turning Lathe. Fig. 2—Rear view showing the pneumatic clamping mechanism

into the work from opposite directions, the tendency to spring the crankshaft is greatly reduced.

A great many safety devices are used to safeguard both the operator and the machine. If the air pressure falls below a certain minimum the machine cannot be started, thus making it impossible for the chuck to release the crank while the machine is operating. The traverse cannot be operated after the machine has started cutting, eliminating the possibility of the operator jamming the machine.

Drive is by means of a direct-connected 30-hp. a.c. motor. An electric dynamic brake is used to stop the spindle in any predetermined position. When the control switch for the driving motor is tripped to the stop position, the motor continues to revolve until a contact on the upper master crankshaft closes, thereby throwing a reverse current to the main driving motor. This brings the motor to an abrupt stop, but it is prevented from starting up again in the reverse direction by a relay switch, which is also mounted on the upper master crankshaft. By adjusting the position of the contacts the spindle may be stopped in any desired position.

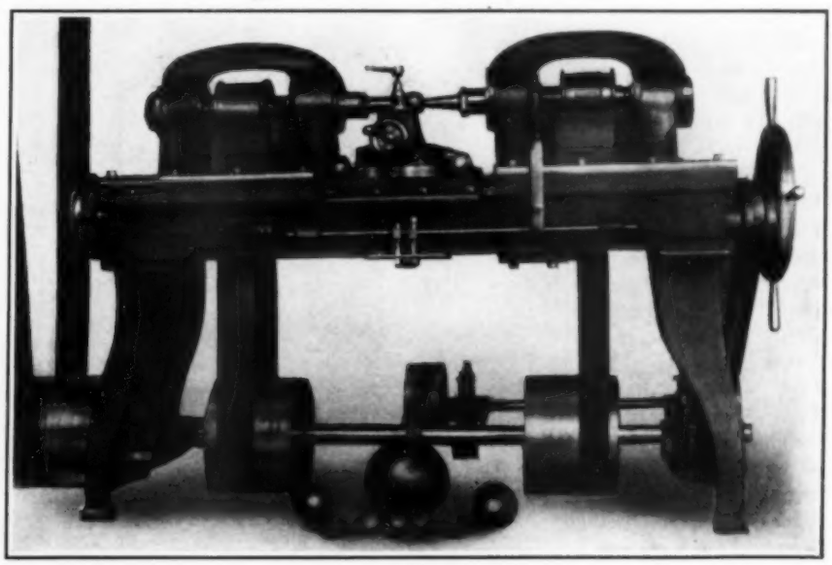
Lubrication is supplied to the slides and bearings of the machine by means of an automatic lubricator mounted on the top. To operate the machine, the crankshaft is slipped into both pot chucks, the steadyrest caps raised, and both air valves opened. This action clamps both pot chucks and the steadyrest caps. The driving motor control switch is pressed to the starting position and when released, it drops back automatically to the running position. The traverse lever can then be engaged. The tools traverse into the work, feed down to the proper depth of cut, traverse out to the starting position, and the spindle stops automatically. The air valves can then be closed and the crank removed.

The production on this machine, according to the manufacturer, is limited only by the possibilities of the crank. The normal production generally averages between 20 and 30 finished crankshafts per hour.

Smith Ball-Turning Lathe

BALLS from 2¼ to 9 in. can be turned on the lathe placed on the market recently by the James M. Smith Company, 203 Main St., Seymour, Conn. As shown in the illustration, the machine is belt-driven. It will be noted that the heads and the bed are of massive construction.

Both spindles run at the same speed, 450 to 800 r.p.m., depending



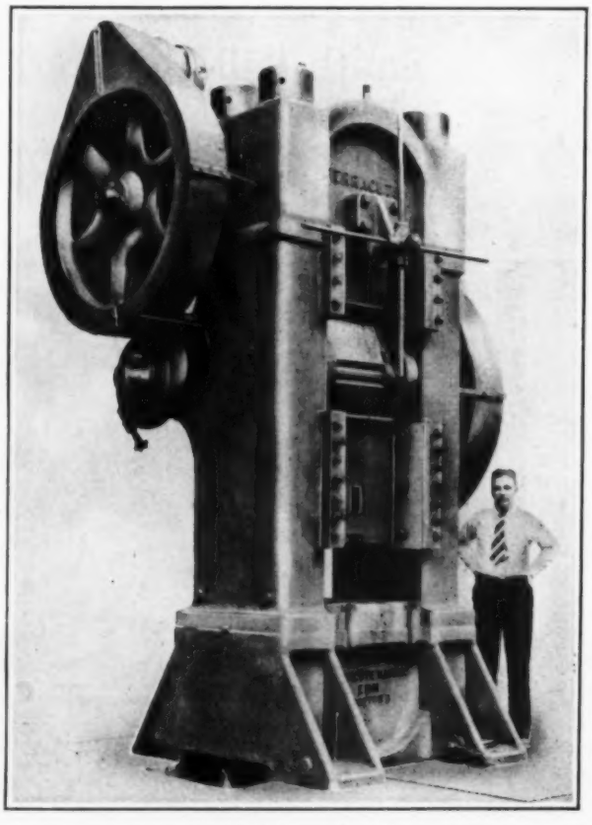
Smith Ball-Turning Lathe

on material and the size of ball, power being delivered to them from the main driveshaft by belt. The friction chucks are tightened by the spoked handwheel at the right-hand end. The power-feed mechanism is actuated by power transmitted from the main driveshaft to the jackshaft at the rear, and thence up to the machine proper. The carriage is adjusted by means of the handle at the extreme left. The feed is entirely automatic, the tool swiveling about the work. Timken bearings are used.

Ferracute 1,000-Ton Coining Press

AN UPPER-TOGGLE coining press, capable of exerting a pressure of 1,000 tons, has been added to the line manufactured by the Ferracute Machine Company, Bridgeton, N. J. The tensile stresses are taken by four vertical steel rods shrunk in the columns, each rod being 8 in. in diam., the ultimate strength of the design being much in excess of the stresses imposed, according to the manufacturer.

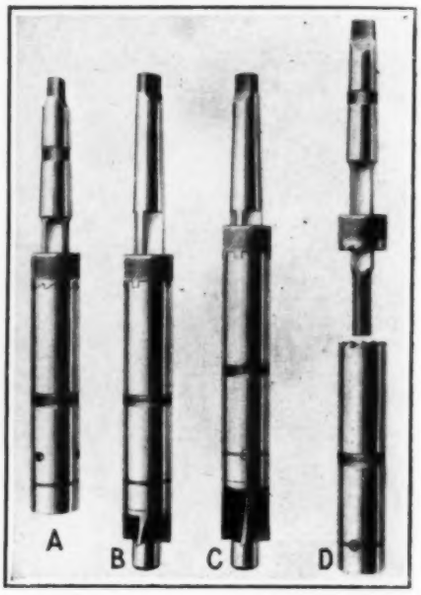
The toggles are steel castings containing hardened and ground steel bushings. The steel toggle links are bronze bushed, and the toggle pins are of hardened and ground steel. A steel casting, bronze bushed, is used for the pitman. The vertical adjustment of the ram is obtained by means of a horizontal wedge operated by a screw that is revolved by means of four hand levers. The weight of the adjustable head and the moving mechanism is taken by two compression springs mounted on the top of the press. The main gear is a steel casting, and the pinion is a steel forging, the teeth on both being cut. Bronze bushings are used for all bearings on the main and back shafts. The press is equipped with a jaw clutch, and the ram has a knockout. Guards are provided for the wheels. A forced lubrication system is used. The press illustrated has a 2½-in. stroke, but a greater stroke may be had when so ordered. The distance, right-to-left, between the columns is 32 in., and the depth of the bed, front-to-back, is 36 in. Height from the bed to the ram at the top of the stroke and adjustment is 20½ in. This height is subject to change. Direct-motor drive is used for the press, which gives 30 strokes per min. The total weight is about 80,000 pounds.



Ferracute 1,000-Ton Coining Press

Eclipse Improved, Quick-Adjustable-Length Holders

Quick and easy adjustment by hand is an important feature of the types "R" and "SD" improved, quick-adjustable-length holders, which have been placed on the market by the Eclipse Interchangeable Counterbore Company, 7410 St. Aubin Ave., Detroit, Mich. The type R, illustrated at *A* and *D* in the accompanying illustration, is in the assembled and disassembled states respectively. At *B* and *C* two views of the type SD are given. Adjustment of either type is made by lifting the small knurled locking collar, revolving the body of the shank to the required length, and then re-engaging the knurled collar with the body. This simple means of adjustment permits the holder to be employed in gangs on a multiple-spindle machine for multiple spot-facing, counterboring, countersinking or core drilling.



At A and D the Eclipse Type "R" Improved Quick-Adjustable-Length Holder is illustrated, while at B and C the Type "SD" is shown

Variations in length of the type R holder is made by turning the ratchet, one notch corresponding to a variation of 0.004 in. Because of the ratchet feature, this type can be employed for right-hand motion only. It will be noted at *B* and *C* that the collar of the type SD is provided with square lugs, thus permitting rotation in either direction. The adjustment obtainable is 0.008 in. per notch.

Only a few parts are used in the construction of either type. The shank is square, and is accurately ground all over. Its ends are ground cylindrically to provide ample bearing area. The tip has a fine thread for fine adjustment. A square broached hole is provided in the sliding collar so that it fits over the shank. As inferred previously, the

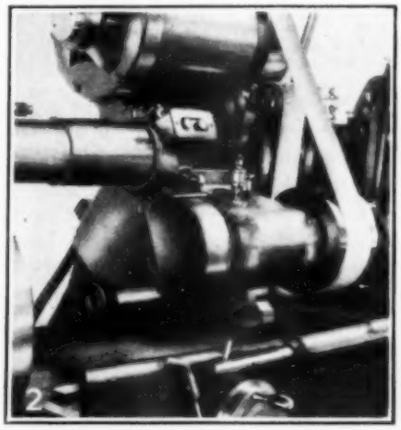
collar may be had with either ratchet teeth or driving lugs for engagement with the body. The hole in the sleeve or body is ground in alignment with the hole at the bottom of the sleeve, which receives either the counterbore, drill, tap or cutting tool. There are no loose springs or keys in this tool. Should the holder be used in a turret lathe or in a horizontal-type, multiple-spindle, drilling machine, the collar is prevented from slipping out of engagement by means of a setscrew. The tool is well adapted for guiding in a fixture bushing, because of the long, uninterrupted bearing surface where oil grooves can be milled if desired.

Bryant No. 12-A Hole and Face Grinder

ANOTHER machine for grinding bores, faces, and sometimes outside diameters at a single chucking has been introduced by the Bryant Chucking Grinder Company, Springfield, Vt. This machine is designated as the No. 12-A hole and face grinder. In general construction and dimensions it resembles the No. 12 motor-driven machine that was described in Vol. 67, page 402, of the *American Machinist*. It has the same general dimensions as the No. 12, also the same maximum swing of 16 in. and maximum stroke of 11 in. It also has the same type of slide with traverse and cross-feed from the overhead bearings.

The wheelslide has a bracket that contains the facing wheelhead mounted on the front. This wheelhead is designed as a single unit, and may be removed by taking off the spindle pulley. Allowance is made for longitudinal adjustment of the wheelhead. Thus it is possible to change the position of the facing wheel to eliminate interference from the hole grinding wheel while the facing wheel is in use. Both wheels are driven from the same motor by means of a single endless canvas belt. The motor is mounted on top of the wheelslide. Belt adjustment is gained by changing the center distance of the motor, which has a capacity of 7½ hp. when running 3,600 rev. per minute.

The slide bar is extended beyond its bearings on the workhead side of the machine, and a weight is attached to counterbalance the weight of the wheelslide, thus making the operation easier when changing the position of the wheels. The machine is equipped with an outside-diameter stop, which is operated by a lever beneath the cross-feed handwheel and throws a floating stop over the feedscrew roll.



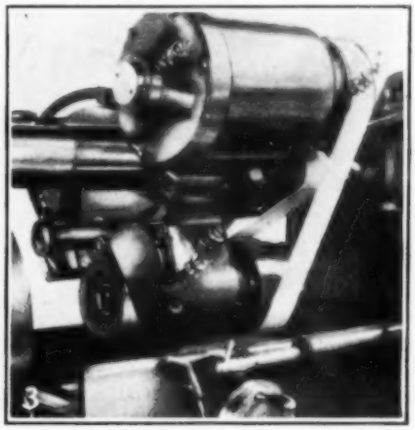


Fig. 2—Close up of the sliding wheelhead showing the hole grinder in position
Fig. 3—The face grinder in the operating position and the hole grinder drawn up out of the way

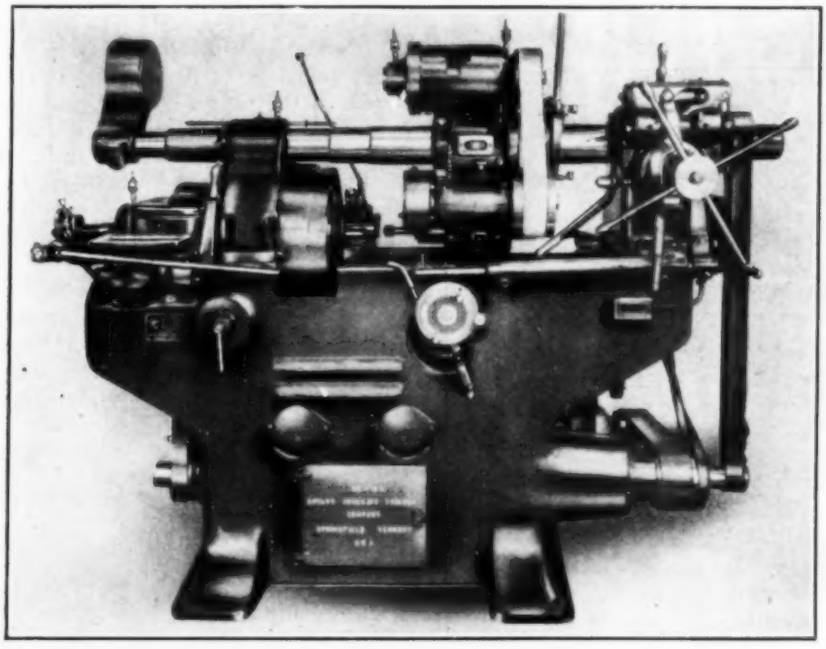


Fig. 1—Front view of the Bryant No. 12-A Hole and Face Grinder

This movement changes the position of the wheels for another operation without disturbing the cross-feed screw position.

With this machine it is possible to grind several surfaces at one chucking, thus decreasing the set up time. Furthermore, it is possible to obtain accuracy in the concentricity and squareness of the various surfaces. Often the wheel for grinding the hole is not the proper one for facing. With this double-spindle machine, it is possible to use the right wheel for each operation.

Morse Spiral-Groove Structural Reamer

Aligning holes with air or electric drills in the fabrication of steel members is the work for which this three-groove, spiral reamer was designed. The tool has been placed on

Morse Spiral-Groove Structural Reamer

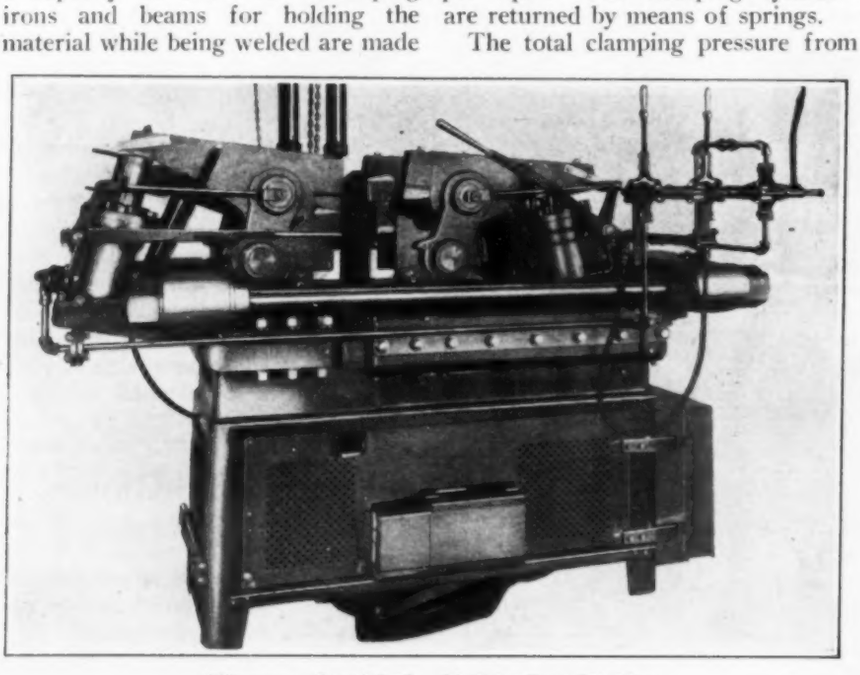
the market by the Morse Twist Drill & Machine Company, New Bedford, Mass. It has a graduated taper and takes a shearing cut. Large chip area is provided in the flutes, and each flute has double clearance. Stock sizes range as follows: From $\frac{13}{32}$ to $\frac{9}{16}$ in. by 32nds, and then to $1\frac{1}{2}$ in. by 16ths. The No. 1702 is this reamer's designation.

Thomson Special No. 19 S.P. Butt Welder

THIS special No. 19 S.P. butt welder was designed for handling rings rolled up out of bar stock $6\frac{1}{4}$ in. in width by $\frac{3}{4}$ in. in thickness by 12 in. inside diam., up to rings 15 in. wide by $2\frac{1}{8}$ in. thick by 27 in. inside diam.; the maximum cross-section at the point of the weld to be reduced so that it will not exceed 12 sq.in. The machine is also capable of handling a maximum width of 16 in. where the thickness is such that the cross-sectional area does not exceed approximately 12 sq.inches.

The water-cooled transformer has a capacity of 500 kva. Clamping irons and beams for holding the material while being welded are made of solid steel plate. The ears which carry the main fulcrum pins of the four clamping arms are cast integral with the platens. There are four of these clamping irons, each pair being opened and closed by a hand lever, located at the front of the machine in such a way as to be convenient for the operator. After the clamping irons have been brought to the closed position, the final clamping pressure is obtained through four hydraulic cylinders. Each pair of cylinders is controlled by separate valves and is designed to be operated at 1,500 lb. per sq.in. The clamping cylinders are returned by means of springs.

The total clamping pressure from each cylinder is 56,000 lb., making a total of 112,000 lb. on each die. The two clamping beams, which pass through the bands or frames to be welded, are counterbalanced, and are designed to be supported from overhead through a special spring-suspension device. This suspension is calculated to carry just the weight of each clamping beam and its counterweight, so that when the clamping arms are in open position the clamping beams may be pulled directly back through the bands or frames to the rear of the welder, thus permitting the insertion and removal of the work.



Thomson Special No. 19 S.P. Butt Welder

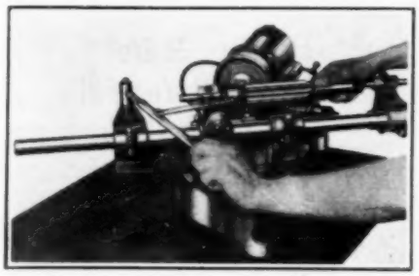
The operation of this clamp is as follows: Assuming that the clamping beams have been swung back out of the way, the work is set in the proper position on the dies. The clamping beams are next slid over the work or through the rings—if the part happens to be a ring—and the clamping beams are brought into the closed position by pulling down on levers shown at the right in the illustration. The valve controlling the cylinder for the right clamp is then opened. The same procedure is followed for the left clamp, and the welding then takes place.

The pressure device consists of a hydraulic cylinder having an area of 60 sq.in., and is designed for use with an initial pressure of 1,500 to 1,600 lb. per sq.in. An initial pressure of 1,500 lb. gives a total force of 90,000 lb., this high pressure being required to overcome stiffness of rings or bands rolled up of heavy stock. The stroke of the piston is 4 in., and the minimum platen opening is $\frac{3}{4}$ in., giving a total maximum platen opening of $4\frac{3}{4}$ in. between the welding dies. The return of the pressure cylinder to open position is by means of small hydraulic cylinders.

The distance from the floor to the top of the welding dies is approximately 50 in. The overall dimensions are approximately 6 ft. wide by 9 ft. long by $5\frac{1}{2}$ ft. high. The dimensions of the base are $26\frac{1}{2}$x67 inches.

Black & Decker Reamer-Grinding Attachment

Straight and taper reamers up to 5 in. in diam. by 14 in. overall length, and 7 in. length of blade may be ground upon the reamer-grinding at-



Black & Decker Reamer-Grinding Attachment

tachment, which has been recently placed on the market by the Black & Decker Manufacturing Company, Towson, Md. It is supplied complete with toolrest, gage for setting toolrest to correct height, and diamond holder for dressing the grinding wheel.

The attachment fits the $\frac{5}{8}$-, 1-, and $1\frac{1}{2}$-in. valve refacers, and adds another use to this tool. A graduated micrometer taper attachment permits grinding taper reamers. The tapered entering cutter found on many reamers can also be ground on the attachment.

Auxiliary Tables for the Pratt & Whitney No. 2 Jig Borer

Two types of indexing tables have recently been developed for the No. 2 jig borer by the Pratt & Whitney Company, Hartford, Conn. The first of these, shown in Fig. 1, is the tilting rotary table, a device which is placed on the regular table of the machine and held in place by means of clamps. Both the tilting and the rotation of the table can be controlled with high accuracy. The second table, which is shown in Fig. 2, is of the rotary indexing type, and is much larger than what has been available previously. Like the standard rotary table, it is graduated at its outer edge in degrees for rough setting, and is provided with a handwheel and a vernier for accurate setting. Clamps lock the table in position during boring.

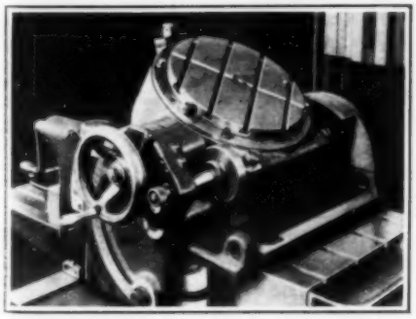


Fig. 1—Pratt & Whitney Tilting Rotary Table for the No. 2 Jig Borer

The tilting table has the rotary part of the table that has been a regular accessory of the No. 2 jig borer for some time. It is used for boring special jigs and drill plates, which are most easily laid out by using polar dimensions, in other words, the angle and the distance

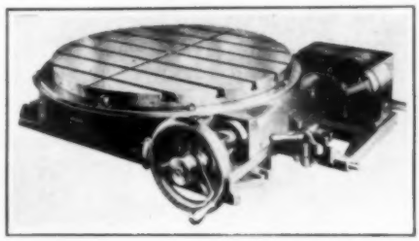


Fig. 2—Large-size Motor-Driven Rotary Table for the Pratt & Whitney No. 2 Jig Borer

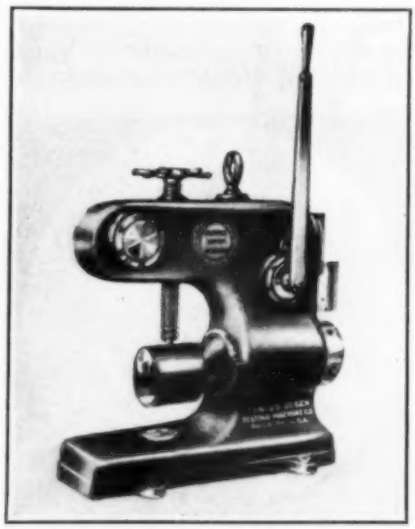
from the center. The table has a scraped surface 12 in. in diam., and is provided with T-slots for clamping the work. The outer edge is graduated in degrees for approximate indexing by means of a large handwheel, which moves the table by means of a hardened and ground steel worm. The wormwheel, which meshes with the hardened and ground steel worm, is part of the cast-iron table itself, and is cut by a special process. One revolution of the handwheel rotates the table through 9 deg. For accurate setting there is a small, slow-motion handwheel, which is connected through gearing to the same shaft as the large handwheel. The large graduated dial on this small shaft is so sub-divided that the table may be indexed accurately to 5 sec. Suitable binders lock the table in position during boring.

The tilting feature is taken care of by hinging the entire rotary table at one side and raising or lowering it to the desired angle by means of a crank, which drives the worm meshing with the gear segment. Graduations are provided that permit setting the table at any angle with the horizontal from 0 to 90 deg., and a vernier is provided for accurate setting to 5 sec. Heavy binders are used to clamp the table in the position desired. This table may be used in boring holes that must be spaced accurately and located at an angle.

In addition to the features mentioned previously, the large-size indexing table shown in Fig. 2 can be moved around rapidly under power by means of a small motor controlled by a convenient lever. This electrical drive couples to the same worm that is moved by the large handwheel. The motor drive can be operated in either direction by the lever at the right-hand side of the table. This large table is placed on the regular table of the jig borer, an adaptor plate being used.

Johnson Types E and F, Lever-Operated, Hardness Testing Machines

Both the types E and F hardness testing machines are lever-operated, and are similar in their general design, the main difference being that the type E has a mandrel in the column for testing tubes and rings. These machines have been placed on the market by the Tinius Olsen Testing Machine Company, 500 North 12th St., Philadelphia, Pa. Each type has a capacity for weights up to 3,000 kg. for Brinnel hardness testing, but weights of 500 and 1,000 kg. can be substituted for testing brass and other metals of similar hardness. The type F machine has a gap of $3\frac{1}{2}$ in. and will accommodate parts up to 6 in. in diam. It is slotted at the base for testing valves. On the other



Johnson Type E, Lever-Operated, Hardness Testing Machine

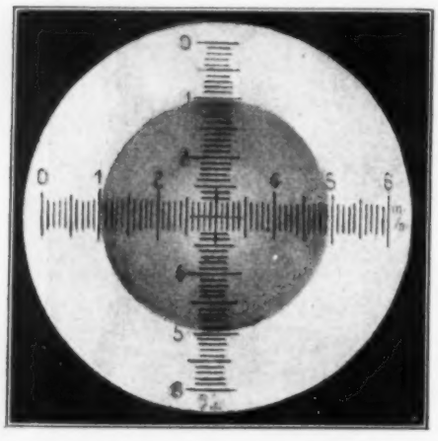
hand, the type E machine is provided with a gap of 5 in. and the largest size that can be tested is 9 in. in diam. The type E is illustrated.

It is possible to secure rapid and uniform testing on each machine. All moving parts work on ball bearings, which provide ease of operation. Only a small force is needed to actuate the hand lever. In operation the lever is drawn forward and down until the weight rises, which prevents automatically any further movement of the lever. A large fine-toothed gear and two pawls are placed on the left-hand end of the lever shaft. The lower pawl prevents the lever falling back, while the upper pawl prevents more than the 3,000-kg. load being applied. The load may be kept on the specimen any desired length of time by means of the retaining pawl. When the lever is returned to its initial position, the adjusting screw can be raised and the specimen removed. For thin articles, a 5-mm. ball is recommended, which may be obtained as additional equipment.

The dimensions of the type F machine are as follows: Length 22 in., breadth 10 in., and height 28 in. Those of the type E machine are: Length 29 in., breadth 12 in., and height 36 in. The weights are 120 and 196 lb., respectively.

Busch-Schumann Projection-Type Brinell Microscope

Sharp focussing of the Brinell ball impression on a ground-glass screen is possible, even though the rim of the impression is lipped, according to the manufacturer of the Busch-Schumann projection-type microscope, which has been placed on the market in the United States by the Paul F. Hermann Company, Keenan Building, Pittsburgh, Pa. The instrument can be set up over the spot to be measured, and it permits reading the screen with both eyes, thus preventing fatigue. As shown in the illustration, with the light falling always perpendicular to the measured surface, the edge of the crater is revealed with equal sharpness even when the rim bulges.



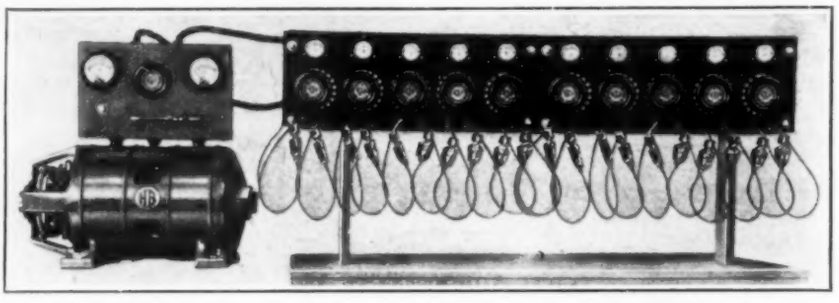
Busch-Schumann Projection-Type Brinell Microscope

The manipulation of the instrument is quite simple. It is about 12 in. long. The projector with its interchangeable lower part is set upon the surface to be measured. The illuminator lights up the surface intensely, and the image is projected clearly through the built-in objective on to the ground glass screen arranged above it. On this screen two diameters at right angles may be easily measured to an accuracy of 1/320 in. or greater with the help of the cross-scales. The ground-glass screen shown can be rotated. It is claimed that measurements can be made both speedily and accurately. The ground-glass slide in the illustration is suitable for measuring crater diameters of $\frac{1}{4}$ in. or 6 millimeters. The scale shown is in metric units.

With a special device, measurements of impressions on recessed surfaces may also be obtained. The upper part of the tube is interchangeable with an angle piece carrying a vertical ground-glass slide. This permits Brinell tests also on the inner walls of hollow cylinders having a minimum internal diameter of $8\frac{3}{4}$ in. Ground-glass images may also be recorded photographically by the insertion of a plate, the necessary accessories for this purpose being supplied separately.

Hobart "Vary Rate" Constant-Potential, Battery-Charging Panels

Due to the small units in which they are furnished, the "Vary Rate" panels may be combined to form complete installations that are limited only by the capacity of the constant-potential battery charger with which they are used. The panels have been developed by the Hobart Brothers Company, Troy, Ohio. Two sizes are available. One is 2 ft. and the other is 4 ft. long. Each is equipped with instruments and connections for five batteries. The short one is for use in shops where bench space is limited.



Hobart "Vary-Rate" Constant-Potential Battery-Charging Panel

Combinations may be worked out for various capacity installations by mounting the units either back-to-back or end-to-end. Each unit consists of an ebony asbestos-board panel on which are mounted five, separate, plainly marked ammeters and five, separate, specially designed rheostats and five sets of battery connectors, which may be quickly and easily removed if desired. It is not necessary, however, to change the connection in order to disconnect the battery from the current supply. The rheostats are so designed that turning the handwheel to the extreme left position disconnects the battery from the bus-bar current. The extreme right position connects the battery to the rapid-charging constant-potential line. In between these two positions are fifteen other positions giving fifteen charging rates, stepping up gradually from left to right. By using the rheostat and referring to the meter, each battery may be given any special treatment.

Taylor Rotary Cutting-Off Machine with Power Feed

A ROTARY cutting-off machine for bar stock and tubing is being introduced into this country by the George Scherr Company, Inc., 142 Liberty St., New York, N. Y., agent for C. Taylor, Ltd., Birmingham, England, the maker. The machine, shown in Fig. 1, is built in two sizes. The No. 1 machine will take 3-in. bars and 4-in. tubing. The No. 2 will take 4½-in. bar and 6-in. tubing. The smallest diameter of material that either will cut is ½ inch.

Inasmuch as the bar does not revolve, it is possible to hold material of any cross-section within the capacity of the vise jaws, and in some cases several bars at once. It is asserted that the feature of holding the stock stationary, and revolving the cutters, reduces the operating time. The cutting-off time for a 1-in. bar is given as 12 sec., increasing by 10 sec. per in. of diameter up to 40 sec. for a 4-in. bar. Tubing requires but one-quarter to one-half the time given for a solid bar of corresponding size.

In operation, the bar to be cut is placed between a portable V-roller stock support and a V-roller guide attached to the machine immediately in front of the self-centering vise. The stock is pushed into the spindle against a pedal-operated stop at the rear. The construction is such that feeding in the stock, gaging it, and clamping the vise jaws are practically one operation.

The mechanism for starting, stopping, and adjusting the feed and cut is located conveniently, and in most cases the only movement necessary is to trip a lever. The spindle and feed mechanisms are driven by hardened steel worms and bronze wormwheels, totally inclosed. Ball bearings are fitted to receive all thrusts.

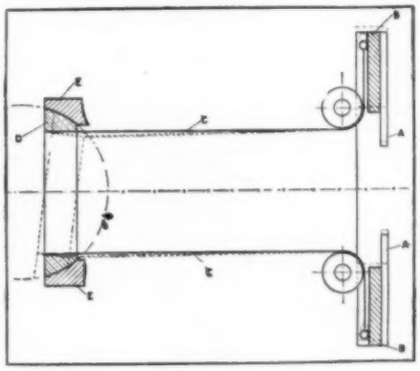


Fig. 2—Diagram of the cutter equalizing mechanism

The cutters are described as being of plain oblong section of high-speed steel, requiring grinding on one face only. In the cutting-off operation, the cutters are adjusted to a diameter slightly larger than that of the stock to be cut. They feed in against helical springs, which they compress. When the feed lever trips, the springs automatically return the cutters to their original position. The cutters are offset parallel with the axis of the work. The result of this is that neither cuts the full width of the parting, thus leaving side clearance for chips. The cut is divided not only in width, but also in depth. Equalizing the depth of cut is unusual, and is secured through the medium of the mechanism shown in Fig. 2. The slide *B* on which is mounted the cutter *A*, is attached to one end of a tension strip *C*, the other end of which is fastened to the equalizer yoke *D*. This yoke is free to move in its spherical seat *E*, and if one blade touches the work before the other it is forced away until the resistance to both is equal.

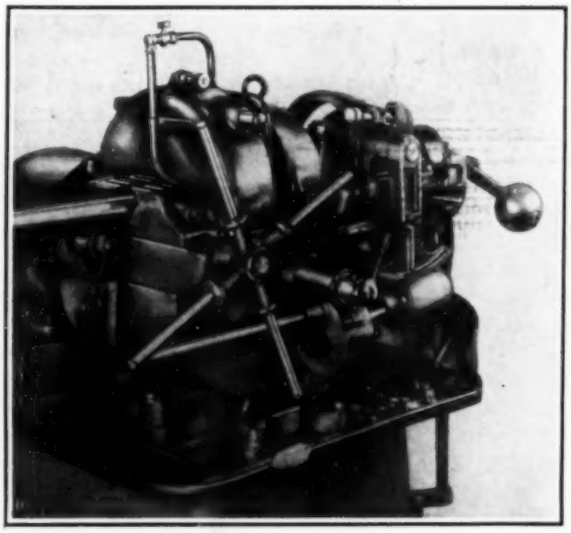
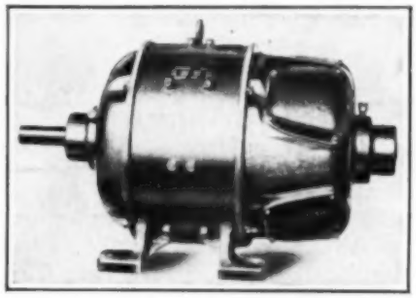


Fig. 1—Close-up of the Taylor Cutting-Off Machine with Power Feed

Roth Watertight Motor

Although this motor was designed for hoist duty, it is also suitable for general application in damp places. The motor was developed by Roth Brothers & Company, 1400 West Adams St., Chicago, Ill. It is rated at 15 hp., 230 volts, 1,150 r.p.m. for 30-min. duty with 55-deg. C. temperature rise. It is compound-wound for operation on d.c., and is reversible.

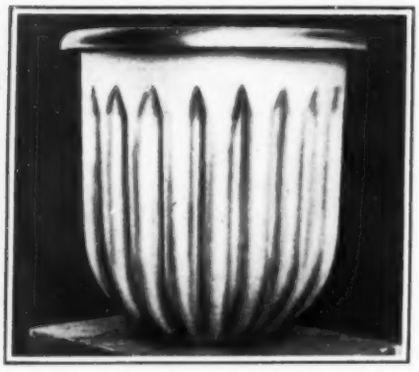
The bracket on the pulley end of the motor is cast solid, whereas the bracket on the opposite end has four handhole covers, the removal of which permits easy access to the commutator brushes and rigging. These covers are attached by means of bolts, and rubber gaskets are placed between the covers and the bracket, which makes for a watertight joint. The machine is fitted with ball bearings, and requires greasing not more than once a month.



Roth Watertight Motor designed for hoist duty

"Hevi-Duty" Corrugated Pot for Hardening Furnaces

Productive capacity of lead and cyanide hardening furnaces can be increased by the use of this corrugated pot, which has been developed by the Hevi-Duty Electric Company, Milwaukee, Wis. The corrugations shown provide approximately 30 per



"Hevi-Duty" Corrugated Pot for Cyanide and Lead Hardening Furnaces

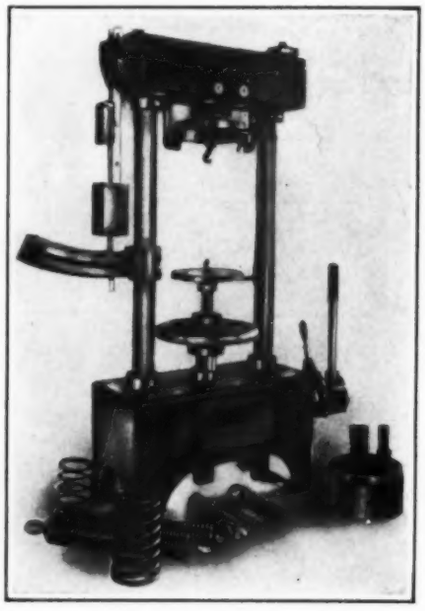
cent more heat releasing and receiving surface than a straight-side pot of equal holding capacity. Because the corrugated surface absorbs heat so rapidly, the coils of the furnace operate at lower temperatures, and the heating time is materially reduced. It was also stated by the manufacturer that the "pinch" effect produced by the corrugations tends to secure a stirring action, which insures uniform temperature and conducts the heat from the walls rapidly.

Coats Type D "Elasticometer"

For the rapid inspection of springs on a production basis, the Type D "Elasticometer" has been placed upon the American market by the Coats Machine Tool Company, Inc., 110 West 40th St., New York, N. Y. Instead of piling up weights on the weigh beam as in the smaller unit described on page 996, Vol. 66, of the *American Machinist*, in this unit, loading is obtained by a pendulum that oscillates between an upper and lower scale where loads can be read directly. The amount of deformation of the spring is read off a scale which indicates the distance between the compression plates or the tension hooks. Two ranges of loading are obtained by using a light and a heavy mass for the pendulum.

Four models of the Type D units are made, being capable of taking loads up to 224, 448, 1,120 and 2,240 lb., respectively, and being designated by their corresponding kilogram ratings, as D-100, D-200, D-500 and D-1,000. There are three types of drive used, according to the load range.

The D-100 tester is suited to light tensile and compressive loads, and the movement of the head is effected through a rack and pinion actuated by a hand lever. Maximum stroke is 6 in., and is controlled by an adjustable stop. With the stop set in position, from 300 to 400 springs can be tested per hour, according to the manufacturer. The D-200 and D-500 machines are driven by a rack and pinion also, but in addition the rack is bored out for a threaded spindle, acutated by a handwheel, which permits fine adjustment on the testing of strong springs. The hand lever on these machines is held in place by a dog clutch, so that it cannot slip back readily. The stroke of the rack



Coats Type D "Elasticometer"

is 5 in. and the spindle adjustment is $3\frac{1}{4}$ in. The dual drives of these two machines fit them for the inspection of both weak and strong springs.

The drive of the D-1,000 machine, on the other hand, is effected solely through a screw spindle and bevel gears. Its stroke is $8\frac{1}{2}$ inches.

All of these machines are intended only for hand operation, power being transmitted through the knife edges and links. In order to accommodate springs of greatly varying lengths, the design has been arranged so as to keep the drive and the weighing mechanism separate, one each in a cast-iron housing connected by two tubular pillars or columns, the length of which may be chosen to suit individual needs. For testing springs of unusual design, additional equipment will be furnished at extra cost, such as circular distance pieces for the pressure plates, intermediate hooks, and guide pins for very slim compression springs.

Three sizes of each model are manufactured. The maximum distances between pressure plates for the three sizes for all four models are 18, 24 and 30 in., respectively. The diameter of the pressure plates is 7 in. in all cases. Maximum heights range from 48 to 60 in., and maximum widths from 36 to 37 in. The smaller scale limits are 56, 112, 448 and 448 lb., respectively.

Space required, all models, 10 x 22 in. Weight varies from 265 to 375 pounds.

"Automatic" Oiling System

Oil is supplied in the correct quantity to each bearing connected to an "Automatic" oiler. This system has been developed by the Automatic Oiler Company, 13,835 Jennings, at Grand River Ave., and Coolidge Highway, Detroit, Mich. In Fig. 1 is shown an assembled unit, whereas in Fig. 2 the various parts are illustrated. Four models known as the types 5, 10, 20 and 40 are available complete with a pulley, which may be had in a diam. of 4, 5, 6, 7, 8 or 9 in., by 1-in. face. If desired, motor drive can be obtained for any unit, including a switch that throws the system out of use when the machine is stopped. In addition, $\frac{3}{16}$-in. copper tubing is furnished. Needle valves and fittings to the bearings are for $\frac{1}{8}$-in. pipe, unless otherwise specified.

The quantity of oil delivered to

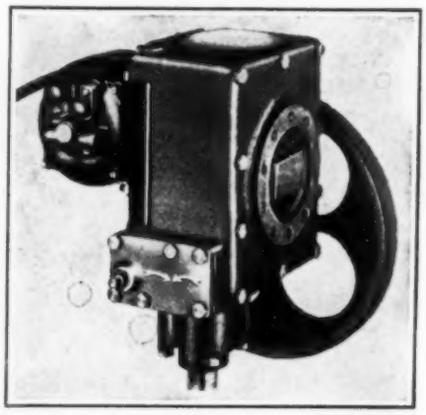


Fig. 1—"Automatic" Oiler with motor drive

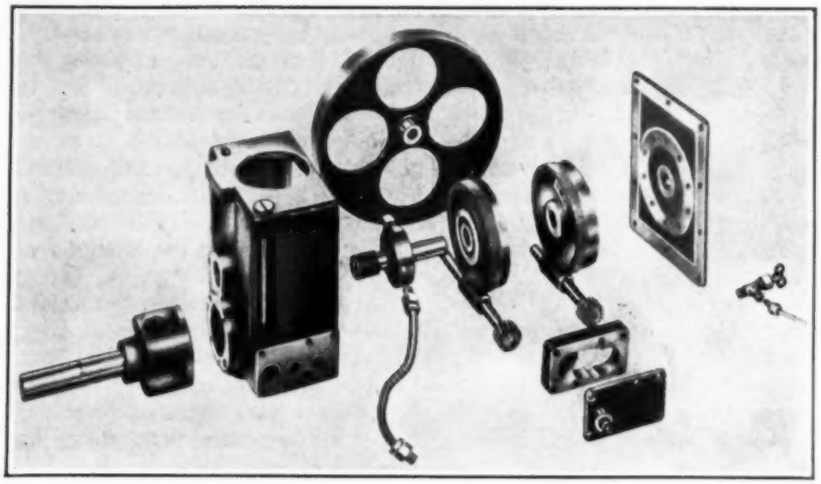


Fig. 2—Parts of the "Automatic" Oiler

each bearing is regulated from one drop to a tablespoonful by means of a needle valve, which is a standard fitting. The time of delivery is regulated by the speed of the driving pulley. On types 5 and 10 it takes about 15 min. at 200 r.p.m. to complete a cycle, and about 20 min. on types 20 and 40. A pair of universal mounting brackets can be furnished that enables the unit to be located in any position desired.

Referring to Fig. 1, oil is passed into the housing through the check at the bottom. It is then sucked into the gear pump. In Fig. 2 are shown two shafts with small gears located on their ends. These gears constitute the pump, and they run in the formed plate. Oil is pulled through the pump, forced along the groove discernable in the formed plate, and through the flexible tube to the stationary collar on the stud. The wormwheel immediately beyond the collar has an annular space, in the bottom of which is a hole. The oil is directed from the stationary collar into the annular ring, through the hole in the first gear, then through the hole in the second gear, and out through the faceplate into the feeder tube. Of course the wormwheels are moving and oil passages meet only at definite intervals. The ratios for the gears are designed so that the oil passages in the wormwheels will mate opposite each succeeding feeder.

The pressure on the pump is regulated by a stud, which maintains the proper clearance between the wormwheels and the front cover. The relieved portion in the first wormwheel allows the oil to flow freely without any pressure on the pump, except when the pump is ready to deliver lubricant to the bearing. Normal conditions require about 25 lb. per square inch.

The types 5 and 10 containers have capacity for about 1 qt. of oil, and the measurements are 6x7½x4 in. The types 10 and 20 contain about 2 qt. of oil, and their measurements are 8x9x4 inches.

"Clarktor" Sweeper

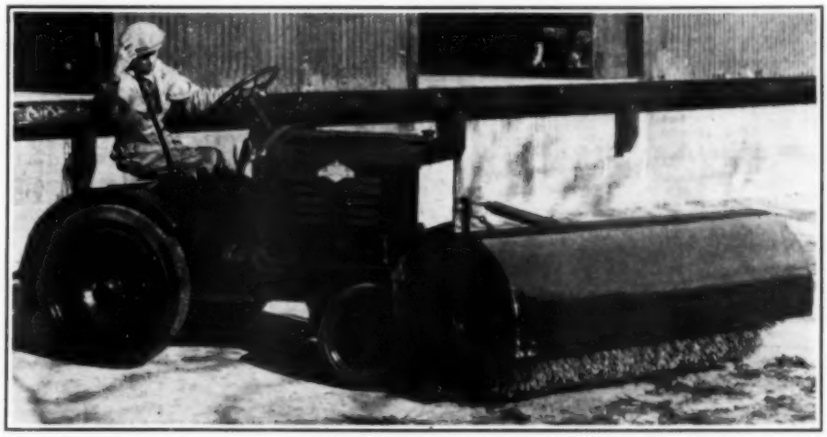
Cleaning factory and warehouse aisles, walks, and platforms and snow removal can be done by the "Clarktor" sweeper, which has been placed on the market by the Clark Tructractor Company, Battle Creek, Mich. The machine sweeps a path 5 ft. wide, the brush revolving at 120 r.p.m. The tension and angle of the brush are quickly adjustable, making the machine suitable for sweeping both narrow and wide aisles. A dust container is provided over the brush, and it controls the movement of the sweepings, and finally deposits them in a swath alongside of the machine.

The sweeper is built on the regular chassis of the Clarktor, and has a self-starter, headlights and full electrical equipment. Its overall length is 127 in. and the overall height is 64 in. The overall width is 82 in. The length of the broom is 6 feet.

"O-Z" Improved Tachometers

Three improved tachometers for measuring rotative and surface speeds have been placed on the market in the United States by the O. Zernickow Company, 15 Park Row, New York, N. Y. Hand and stationary type tachometers are available for measuring rotative speeds, the hand type being shown in Fig. 1. In Fig. 2 is shown a "Cutmeter" for measuring surface speeds. The hand tachometers are of the single-spindle, triple-, quadruple,, and quintuple-, selective-

Fig. 1—"O-Z" Improved Hand Tachometer in case with accessories



"Clarktor" Sweeper shown cleaning up heavy debris in a factory yard

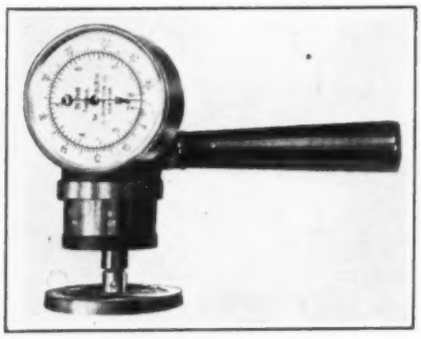


Fig. 2—"O-Z Cutmeter"

range type. Nine styles of this type are available. The lowest rotational speed that can be measured by any type is 20 r.p.m., and the highest is 40,000 r.p.m. The weight of the device is 12 oz. The standard range for the stationary type is from two to twelve times the minimum speed, either for r.p.m. or f.p.m. The Cutmeter has four ranges for surface speeds from 20 to 2,650 ft. per minute.

The construction of all types is essentially the same. The housings are made of aluminum alloy, black enameled, with polished bezel ring. In contrast with the former design, the improved tachometers have no sliding gear shift for engaging the different ranges. The gear shift of the improved type is of the rotating type. Shifting is done by turning the tachometer barrel with the thumb and index finger until the desired range is in line with the dial center.

The indicating mechanism is actuated by a double cross pendulum with links operating the plunger on opposite sides. To eliminate vibration of the indicating hand, a damping mechanism is built into the indicating train. The hand tachometers are furnished with a plush-lined carrying case, as shown in Fig. 1, containing the complete outfit, which includes a steel point for measuring up to 200 r.p.m., and rubber point for over 200 r.p.m., a rubber sleeve, a funnel center for thin shafts having no center hole, a 3-in. extension bar, a rubber-bound Cutmeter wheel, and a drop lubricator.

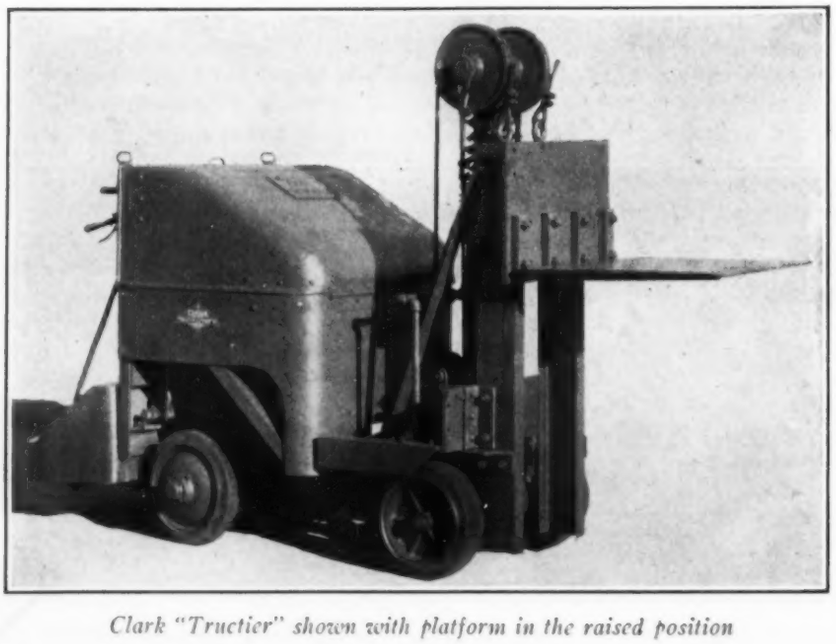
Clark "Tructier"

A WIDE variety of tiering and transporting operations can be performed by means of the "Tructier" manufactured by the Clark Tructractor Company, Battle Creek, Mich. The machine is illustrated with the platform at the highest point in its travel. In this position the overall height of the machine is 6 ft. When the platform is resting on the ground, the platform height at the back is $1\frac{5}{8}$ in. and at the front $\frac{3}{4}$ in. It will elevate 1 ton to a height of 3 ft. 2 in. The standard platform is 26 in. wide by 30 in. long, although an optional platform 18x36 in. may be obtained for tiering skids, which are handled ordinarily by jack-lift trucks.

If desired the platform may be removed and steel supporting fingers used. These fingers have a length of 26 in. During the first 6 in. of its upward travel, the platform tilts backward 5 per cent and assumes a horizontal position. The platform may be stopped and the direction of motion changed at any point.

Another variation of this machine is used for handling bales of wire, tires, and other bulky materials that must be handled on a ram. The ram is fastened to a removable bracket bolted to the vertical platform of the machine in the illustration. It is 3 in. in diam. and has a length of 30 in. The minimum height of the ram is 12 in. from the ground and the maximum height is 50 in. The truck has a capacity to lift 1,500 lb. The position of the ram on the vertical plate may be shifted so as to increase or decrease its minimum height. Other types of lifting devices such as fingers or a crane can be fastened to the vertical plate in a few minutes.

This Clark "Tructier" is built in conformity with the standard Clark "Trucklift." It is gasoline propelled, and has a speed of 6 mi. per hour in either direction.



Clark "Tructier" shown with platform in the raised position

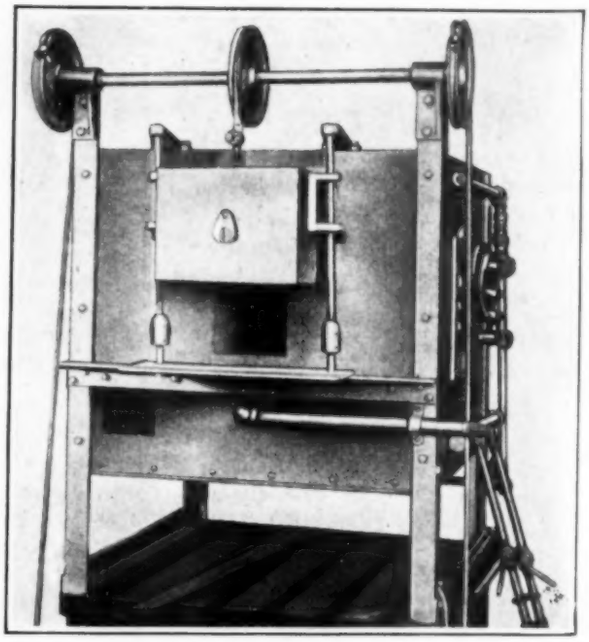
Hayes Improved HG No. 31 Furnace for Hardening High-Speed Steel

Apparatus for controlling the furnace chamber atmosphere has been applied to the HG No. 31 furnace for hardening high-speed steel, which is manufactured by C. I. Hayes, 129 Baker St., Providence, R. I. According to the manufacturer, if the atmosphere in the furnace chamber is not controlled, the work will be badly scaled and pitted, or soft spots will be encountered. By means of the controlling device, an inert or reducing atmosphere is maintained, a curtain of transparent gases being projected across the furnace opening so that the door may be held wide open if desired. It is understood that the maximum hardness and working qualities of the steel are secured, and that uniform results are obtained.

The furnace is designed for use on single-phase a.c. circuits with a trans-

former at any standard voltage up to 600. It may also be used on d.c. circuits at either 110 or 220 volts. Only one size of heating chamber is recommended, which is 6 in. high by 5 in. wide by 12 in. in length. The maximum temperature obtained is 2,500 deg. F., and the power input is 18 kw. This type is suited particularly to a wide range of different shapes and sizes.

"Globar" non-metallic heating elements are used in this furnace. The Globars are mounted between two terminals, which extend through the furnace walls to the power connections. The connections are made of special alloys, which are able to resist heat and oxidation, and are water-cooled. The doors are insulated and closely fitted to prevent heat loss. Heavy boiler plate construction is used for the case, which is strongly braced and reinforced with angle iron. The legs are of sufficient length to raise the hearth approximately 30 in. above the floor level. When desired, however, the furnace may be mounted on a platform or separate stand.



Hayes Improved HG No. 31 Furnace, equipped with furnace-atmosphere control apparatus for hardening high-speed steel

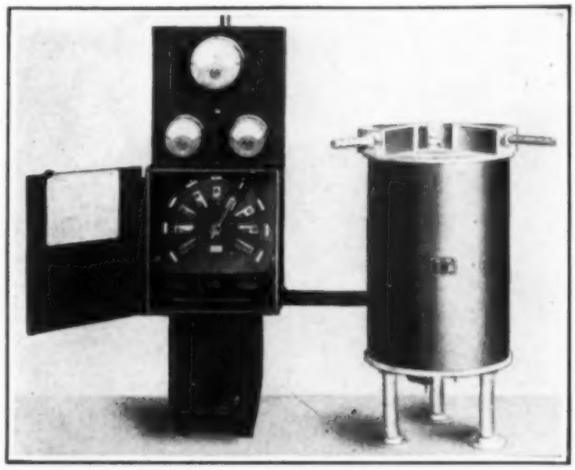
"Gramix" Bearings

A molded, self-lubricating bearing known as "Gramix" has been developed by the U. S. Graphite Company, Saginaw, Mich. The bearing material consists of finely-powdered lubricating graphite, together with copper and other metals. The various materials are weighed out to insure uniformity, and are then placed in mechanical mixers until a homogeneous mixture is produced. It is then transferred to the hydraulic and mechanical presses where it is molded to the desired size and shape. Owing to the manner in which "Gramix" is manufactured, individual steel molds must be made for each size bearing. After the molding process, the bearing is baked, the temperature meanwhile being carefully maintained. It is then machined to specifications, but a minimum tolerance of 0.001 in., is recommended. In this process, graphite is built right into or becomes an integral part of the bearing metal itself. These bearings are intended for isolated points.

"Hevi-Duty" Improved Wild-Barfield Furnace

An improved electro-magnetic furnace of the Wild-Barfield type has been placed on the market by the Hevi-Duty Electric Company, Milwaukee, Wis. Other furnaces of similar design marketed in the United States by the above company were described on page 560, Vol. 69, of the *American Machinist*. The unit illustrated consists of the usual type of box or vertical furnace, but is equipped with electrical circuits to establish a magnetic field through the work and a meter to measure the strength of this field. The circuits are so arranged that no deflection of the needle occurs with the furnace empty, but, when steel is placed in the furnace, the meter immediately indicates an increase in the strength of the field caused by the magnetic properties of the steel. When the steel is heated to the critical point throughout its entire mass, the needle returns to zero.

This furnace is suitable for treating all carbon steels having more than 0.4 per cent carbon, and alloy steels whose critical temperatures are below the safe working limits. These include most of the usual tool steels, with the exception of high-speed steel.



"Hevi-Duty" Improved Wild-Barfield Heat-Treating Furnace together with control apparatus

Cutler-Hammer Type 70-50 Push-Button Switch

This feed-through switch is for use with small industrial tools. It has been placed on the market by the Cutler-Hammer Manufacturing Company, 12th St. and St. Paul Ave., Milwaukee, Wis. The internal mechanism has been so improved and has been made so compact that the

Cutler-Hammer Type 70-50 Push-Button Switch

wiring space is quite large. In addition, the cover screws are anchored to prevent complete removal and loss.

To facilitate quick installation, these switches are shipped open. Thus it is necessary to attach only the wires to the terminals and replace the cover. The entire case is of Bakelite, and a black and red button designates when the current is "off" and "on."

"De Vlieg Supermil" Milling Machine

ALTHOUGH designed for mass-production milling, the "De Vlieg Supermil" has advantages when the plain milling of small lots is considered, particularly when high accuracy and heavy cuts are necessary. The machine has been placed on the market by the Walcott Machine Company, Jackson, Mich. A left-quarter view of the front is given in Fig. 1, whereas Fig. 2 presents the left-quarter view of the rear. Some of the principal features are: Tool steel table ways, hardened and ground; a new type of gib construction providing steadiness of the table during heavy cuts, and a large feedscrew of alloy steel having a special thread form, hardened, ground, and lapped. Backlash is eliminated by the combination of a special device with the feed screw. Thus it is possible to feed the work with and against the cutter and obtain a uniform thickness of chip per tooth and also use climb cutting as the regular method for all types of work within the range of the machine.

Other features of the "Supermil" are: Automatic flood lubrication, Timken bearings, large chip pan and coolant system, a truss-type overarm, flange-type motor drive, ground-tooth gears, splined shafts, and great rigidity.

Three sections are fastened together by means of nickel-steel bolts, shrunk in place, to give the main frame. These sections are: The pan forming the chip pan, base, and coolant compartment; the bed carrying the table ways and housing; and the column and spindle head mounting.

The table is a ribbed casting 6 in. deep. The ways are of the V and flat types working in conjunction with a new type of interlocking square gib, both front and rear, each gib bolted in position with the heel resting on laminated shims, which provide adjustment for wear. The V-way is in the rear toward the column and the flat way is in front. This construction is shown in Fig. 3. The ways are of hardened tool steel, ground in position. Both ways and gibs are oiled automatically under pressure from the central circulating system. The advantage of this construction is a continuous true plane of travel for the table and provision for handling a lifting tendency as well as the normal down pressure.

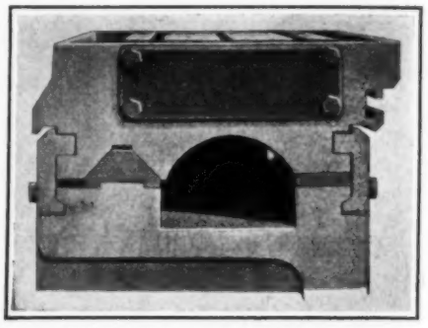


Fig. 3—Way and gib construction of the "De Vlieg Supermil"

A flange-type motor using a standard 10-hp. rotor and stator and special end plates is standard construction. The motor shaft carries a pinion meshing with the main gear of the main drive bracket unit. Both pinion and gear are hardened and have ground teeth. In addition to this the main drive unit comprises a multiple-plate disk clutch for starting and stopping the main spindle, bevel gears for transferring the drive to vertical shaft, and a pinion for driving the feed and rapid traverse mechanism and the drive for the lubricating pump. This is shown in Fig. 4. The unit is self contained, enters the bed from the bottom, and is mounted on a plate bolted to the bottom of the

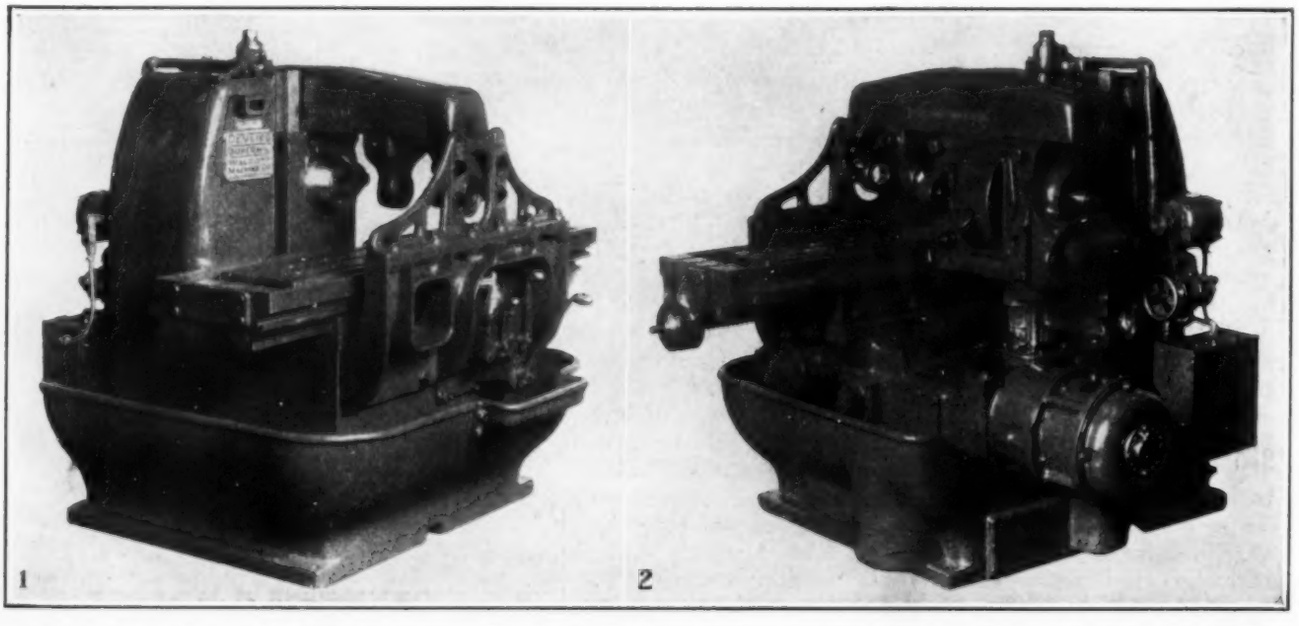


Fig. 1—Left-quarter view of the "De Vlieg Supermil" Milling Machine. Fig 2—Rear view showing drive arrangements

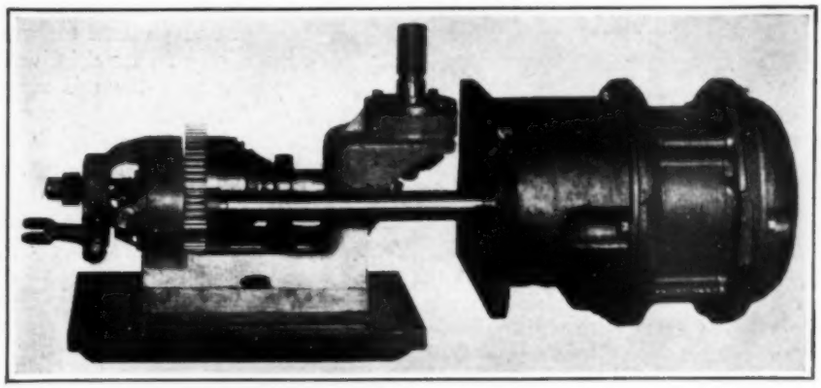


Fig. 4—The main drive unit is self-contained

bed. This construction provides convenient means for alignment with the spindle head. The entire unit is mounted on Timken bearings, and is lubricated with a shower of oil.

The spindle is a hardened alloy steel forging, and is ground all over. The nose construction is in accordance with the new standard adopted by the National Machine Tool Builders' Association. The spindle is mounted on Timken bearings in a 7-in. hardened and ground, forged steel quill, which provides endwise adjustment of 2 in. Extreme accuracy of this adjustment is affected by a sensitive worm mechanism supported endwise by the main casting adjacent to the rack section of the quill. The spindle head casting is of heavy box construction having a long slide on the column projecting well above and below the spindle center line. It also houses the spindle change-gear mechanism. The drive is taken from a vertical shaft extending from the main drive bracket in the base. This shaft runs at a constant high speed, and through a pair of reduction bevel gears drives the first pickoff gear shaft. Pickoff gears are mounted on splines, and are locked in position. They are of hardened alloy steel and have ground teeth. They provide a range of spindle speeds from 20 to 180 r.p.m. in the standard machine, but through modifications much higher speeds are possible with special ratios. The second pickoff gear shaft is integral with a long pinion meshing with the main spindle gear, which is secured to the spindle by a taper and heavy key. Its section is sufficiently heavy to function as a flywheel. It is hardened, and the teeth are ground. The mating pinion is made long enough so that the spindle gear, when sliding endwise with the spindle adjustment, will have full contact for the full 2 in. of adjustment. Grinding the teeth of these gears reduces the backlash in the spindle drive to a minimum. All shafts are mounted on anti-friction bearings, and are submerged in oil. The vertical slide is of V- and flat-way construction with an interlocking gib both front and rear. Two screws in the front gib lock the spindle head in position and correct any misalignment. The overarm is of truss construction, alignment being obtained by a V-section in the center supported by narrow flats at the extreme edges.

The feed and rapid traverse and their control mechanisms are built into a sectional unit as shown in Fig. 5. This table-propelling mechanism provides a power feed with a range of from 1.8 to 21 in. per min. in either direction, and a power rapid traverse movement of 180 in. per min. in either direction. The two functions are divided, the rapid traverse connecting directly into the table screw gear through slow-speed, positive, jaw clutches. This section of the unit is protected by a multiple-disk slip clutch, under spring tension, that provides ample power for ordinary operation, but will slip without any ill effects should the operator run the table into an obstruction. A take-off from this unit provides the power for the feed unit. This section embodies the necessary reduction gears and means for changing the ratios through pickoff gears adjacent to the final drive. A second yielding device, having ratchet teeth under heavy spring pressure, is designed to slip and sound a warning when the table screw delivers an excessive load. Thus the unit is fully protected against breakage. This unit carries the control mechanism for the entire machine, the starting and stopping lever for the spindle, the feed lever, and the rapid-traverse lever. The rapid traverse is operative when the spindle is running or stopped.

The feed can be engaged only when the spindle is in motion. The feed and rapid-traverse levers are interlocked. Interlocking means are provided also between the feed lever and the starting lever. A spring-loaded device engages the reverse rapid traverse automatically at the end of the feed stroke in either direction. The machine can be caused to operate automatically or otherwise by the selection of proper trip dogs. All parts are of alloy steel.

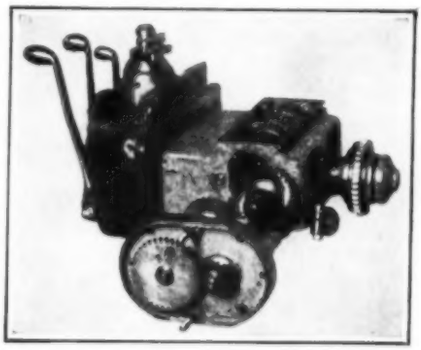


Fig. 5—Control mechanisms are built together in this sectional unit

The feed screw, shown in Fig. 6, is a departure from conventional types. It is 2 in. in diam. The spe-

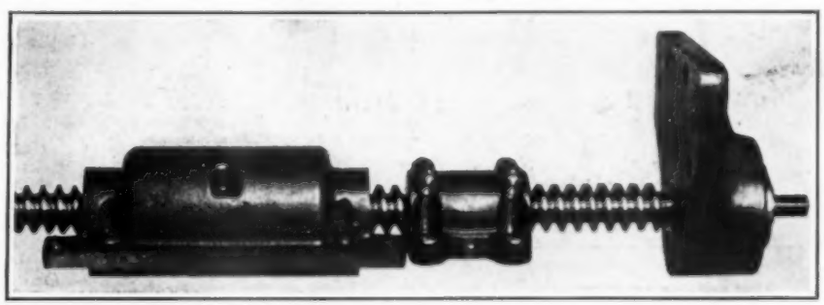


Fig. 6—Special feed screw and mounting

cial form of thread, having a $\frac{5}{16}$-in. bearing on each side, is made of special, oil-hardened, high-carbon, alloy steel, and is hardened and ground all over, and lapped in the threads. The nut is of bronze, and is lubricated automatically under pressure. The feed screw is connected to the table through a heavy bracket bolted on the end of the table. Thrusts are taken on a self-aligning roller thrust bearing having a capacity of 15 tons.

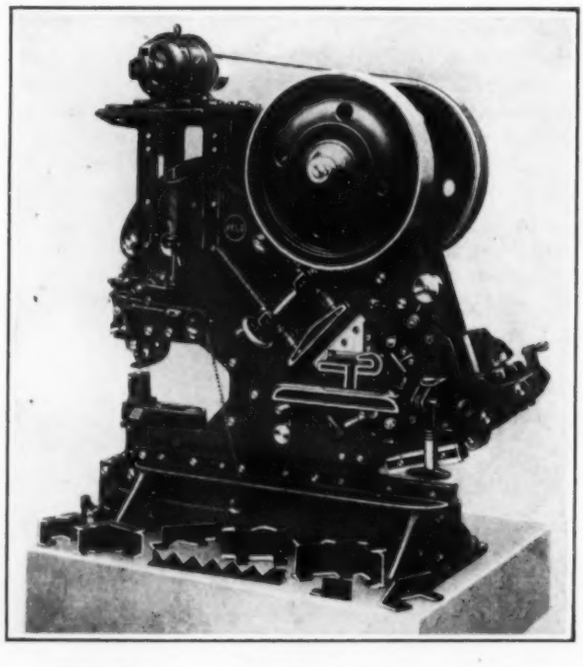
The table width is 16 in., and it is furnished with varying lengths of feeds, namely, 24, 30, 36 and 42 in. The spindle is adjustable vertically to a minimum distance of 2 and a maximum of 14 in. from its center to the top of the table. The vertical adjustment is made with a hand-operated screw, having a micrometer dial. A large pan provides a generous coolant tank and means for handling a large quantity of chips, all being accessible for cleaning. The coolant is circulated by a geared pump with separate motor drive, and provides 30 gal. per minute.

Pels Nos. 13 and 16 Type MAE Combined, Punch, Shear, and Coper

PUNCHING, slitting, angle and bar cutting, and coping can be done on the Nos. 13 and 16 type MAE multi-purpose machines, which have been placed on the market by Henry Pels & Company, Inc., 90 West St., New York, N. Y. All of these operations are performed without changing the set-up or the knives. These machines make 40 and 36 strokes per min., respectively. If desired, a rectangular coper can be substituted for the triangular notcher shown.

Holes, $\frac{7}{8}$ and $1\frac{1}{16}$ in. can be punched through $\frac{5}{8}$-in. plate by the respective machines. By simply turning a knob, the punch floats over the work and stops at any desired point. The depths of the throats of the Nos. 13 and 16 are 12 and 20 in., respectively. Centering is done by means of a hand lever. The stripper provided is removable and adjustable without the use of tools.

Channels are milled in the frame adjacent to the slitting shear to facilitate feeding the plate. The lengths of the slitting shears of the two sizes are $10\frac{1}{4}$ and 12 in., respectively; the lengths of the strokes being $1\frac{3}{8}$ and $1\frac{7}{16}$ in. Trimming of the legs of angles can be done, because of the high plate throat construction and the hold-down operated by a worm gear. Each of the reversible knives has four cutting edges. They are interchangeable. Plates of any width, $\frac{1}{2}$ and $\frac{5}{8}$ in. thick, can be sheared on the respective sizes.



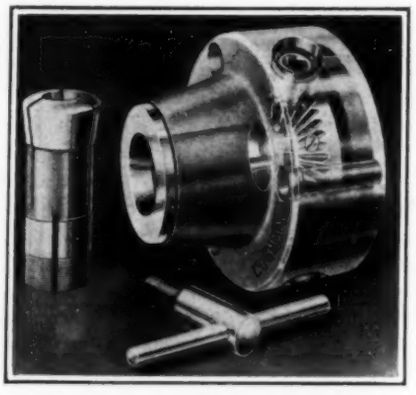
Pels Type MAE Combination Punch, Shear, and Coper

Angles can be cut square or on the bevel, four ways, on the central shear. The maximum sizes sheared on the two machines without changing knives are 5 x 4 x $\frac{3}{8}$ in. and 6 x 4 x $\frac{3}{8}$ in. Rounds, squares and Ts can also be cut without changing the knives. The rounds cut are $1\frac{3}{4}$ and $2\frac{1}{8}$ in., respectively. Bevels up to 45 deg. can be cut on angles or Ts by setting a gage, which can be dropped back out of position to permit quick insertion of special knives. A double-spindle hold-down is used for all work. It is operated by means of a handwheel and worm gear. The diagonal slide permits feeding all shapes with the flat surface up, thus facilitating handling. Notching of 3x3x$\frac{5}{16}$- and 3x3x$\frac{3}{8}$-in. angles can be done on the respective sizes.

Power required by the Nos. 13 and 16 machines when belted to the motor is 4 and 6 hp. respectively. Direct gear drives require 5 and $7\frac{1}{2}$ hp. The net weights of the two machines are 3,750 and 5,300 pounds.

Cushman No. 15 Nose-Type Collet Chuck

The range of collet sizes that can be handled by this chuck is from $\frac{1}{2}$ to $1\frac{3}{4}$ in. by 32nds, thus giving a larger range than has usually been the case heretofore. The device has been placed on the market by the Cushman Chuck Company, Hartford, Conn. It is intended to be mounted on a spindle nose by bolting it to an intermediate plate in the same way that a lathe chuck would be.



Cushman No. 15 Nose-Type Collet Chuck with Collet hand key

The collet fits in the tapered wall of the chuck body, and is threaded so that it can be drawn back into the body by means of a disk having a tapped hole and also a bevel gear cut on the face. The bevel gear plate is turned by the usual pinion and key.

The body of the chuck is made of a solid piece of heat-treated steel. There are two ground bearings for the collet, one at the back of the body and the other at the nose. The disk and the pinion are heat-treated.

NEWS OF THE WEEK

Niles Tool Works in Merger with Hooven-Owens

The Niles Tool Works Co., of Hamilton, Ohio, a subsidiary of Niles-Bement-Pond Co., of New York, N. Y., and maker of heavy machine tools, and the Hooven, Owens, Rentschler Co., also of Hamilton, have been merged into a new company to be known as the General Machinery Corporation. The Hooven-Owens company builds presses, rolling mill equipment and stationary steam engines. Niles-Bement-Pond is to receive stock in the new corporation in exchange for stock in the Niles Tool Works Company.

G. A. Rentschler, president of Hooven-Owens, will be president of the new corporation. He is a brother of Gorden S. Rentschler, of the National City Bank, and of Fred B. Rentschler, of the Pratt & Whitney Aircraft Co.

Wm. B. Mayo, chief engineer of the Ford Motor Co., A. A. Byerlein, and Curtis T. Zeigler are vice-presidents of the new corporation, and Walter A. Rentschler is secretary-treasurer, all being directors also. Other directors are: Gordon S. Rentschler; Edward A. Deeds, director of the National City Bank of New York; Fred B. Rentschler; J. K. Cullen, president of the Niles Tool Works Co.; Leonard S. Horner, president of the Niles-Bement-Pond Co.; Sanford S. Etherington, director of N.B.P.; and G. H. and C. H. Helvey, both directors of Hooven, Owens, Rentschler.

Western Metal and Machinery Exposition Plans Progressing

One of the largest displays of machinery ever assembled in the West is to take place in Los Angeles, January 14 to 18, at the Western States Metal and Machinery Exposition being held in conjunction with the Western Metal Congress, under the sponsorship of the American Society of Steel Treaters. It is expected that about 15,000 technical men will attend the exposition.

Almost every type of machine will be included in the exhibit, including machine tools, heat-treating furnaces, mining and oil-well machinery, together with materials of all kinds. The exhibit is to take place in the Shrine Auditorium of Los Angeles.

In connection with the Congress many technical societies are to hold simultaneous sessions. Among the papers to be presented at the sessions of the American Institute of Mining and Metallurgical Engineers, will be: "Electro-Plating and the Uses of Copper in Machinery," "Heat-Treatment of Gears," and "Bearing Metals." Some phases of aircraft construction, a paper on aluminum, one on the production of nickel-steel castings by electric furnace method, and a paper on the manufacture and heat-treatment of automobile leaf springs are to be presented at the sessions of the Society of Automotive Engineers. At the session of the American Society of Mechanical Engineers a symposium of four papers on the manufacture of oil-country specialties is to be presented.

A paper on the welding of steel buildings and bridges, and one on heat-treatment by means of the oxy-acetylene flame are two of the five papers to be presented at the sessions of the American Welding Society. The American Petroleum Institute and the Pacific Coast Gas Association will also hold sessions. At the latter several papers on heat-treating furnace design will be presented. In addition there will be a Foundry Division Program, including a paper on the heat-treatment of carbon and alloy steel castings.

The convention sessions will be held each morning, with trips to the exposition and industrial plants in the vicinity of Los Angeles each afternoon.

Nickel Merger Progressing

The International Nickel Co., of Canada, Ltd., to which were recently transferred the physical assets of the International Nickel Co. of New Jersey, has made a formal offer for the stock of the Mond Nickel Co., Ltd., of England. In the event of acceptance, control of more than 90 per cent of the world's supply of nickel, for all practical purposes, will pass from American into Canadian hands, thus giving the company a monopoly of the world's nickel supply, which could not have been obtained under American laws. The International Nickel and the Mond companies own portions of the Frood mine in Canada, from which the future nickel supply of both is to be obtained. Financial control of the company still remains in American hands in the form of the International Nickel Holding Corporation, a New Jersey corporation.

Gain in Ford Production

Ford production, which has been climbing steadily since last January, now amounts to 25 per cent of all the automobiles produced. The total number of factories are turning out 6,000 cars a day, of which Detroit is accounting for 4,100. As time goes on, more and more work is being "farmed" out on contract. For example, all storage batteries are being purchased from an outside concern, and the entire steering gear contract has been given to one of the smaller Detroit companies specializing in this line. Kelsey-Hayes of Detroit also is supplying one-third of Ford's wheel requirements. The Briggs Manufacturing Co. is supplying 2,500 bodies daily and the Murray Corporation shortly will be supplying other bodies also. The National Acme Co. of Cleveland is supplying 8,000 shock absorbers per day. It is understood also that the Electric Auto-Lite Co. is making a considerable portion of the starting-lighting systems.

Rail Equipment Outlook Brighter

The outlook for the railroad equipment industry in 1929 is the best in half a decade, says The Union Trust Co., Cleveland. Although railroad buying dropped to a low ebb in 1928, the bank finds evidences that the trend is now gradually upward.

"The equipment industry has languished in recent years, as a direct result of the extraordinary achievement of efficiency by the roads," says the bank in its magazine, *Trade Winds*. "By means of speeding up freight movements, the roads have accomplished the same increase in their service as if they had added approximately 800,000 cars to the number of their purchases since 1921.

"It now is beginning to appear that the point has been reached where no further great increases in efficiency can be expected. This view is supported by the relative decline in the number of surplus cars and the increase in the number of cars in bad repair.

"Indications of probable betterment in the equipment industry are found in other factors, including better earnings for the transportation systems, and in the prospect for general industrial prosperity in 1929, with probable further expansion in transportation requirements of the country.

"Moreover, the edict against cars of wooden construction issued recently by The American Railway Association, means the gradual replacement of wooden cars by new steel ones."

Added to this opinion is the recent inquiry for 1,000 freight car bodies for the Pennsylvania R.R. and the awards of 500 hopper cars for the Boston & Maine, 200 automobile cars for the Chicago and Eastern Illinois, and 200 gondolas for the Great Northern—EDITOR.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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HERE in New York it is difficult to keep one's feet upon the ground when attempting an appraisal of financial conditions. There is so much talk of the millions that have been made in the stock market and the other millions that are being distributed by stock brokers to their clerks, that Wall Street seems to be a place where everyone has an Aladdin's lamp that is even more magical than the luminary described in the Arabian Nights.

The Christmas trade has been greatly stimulated by the bonus checks that have been distributed, the savings that have been withdrawn from the "Christmas Clubs," and the largest dividend and interest disbursements that investors have ever received.

The stock market has been steadier, and it is also anticipated that the interrupted advance will be resumed early in 1929, because easier money is normally to be expected after the holidays, and because the forecasters are uniformly predicting that business activity will continue very high through at least the first quarter of the year.

The industrial facilities of the country appear to be fully employed, and the goods produced seem to be finding a ready market. Automobile production is gaining, the steel output just before the holiday slackening was at the highest level in a month, and construction is very active considering the season.

In the circumstances, a detailed discussion of the insignificant price movements that have occurred hardly seems necessary, and as the year ends, it may be more profitable to consider in how far the prevailing optimism with regard to the future is justified.

There are two schools of thought upon this subject. One finds an analogy for the present situation in the era of prosperity that succeeded the Battle of Waterloo and the ending of the Napoleonic wars. It is pointed out that the marvelous prosperity that Europe enjoyed from 1815 to the forgotten panic of 1825 was largely due to the invention of the steam engine, the utilization of coal, which was then a comparative novelty, and the introduction of illuminating gas.

It is maintained that the automobile, aviation, hydro-electric power and electricity, including the radio and the telephone, have added enormously to the world's wealth, and provided remunerative employment for millions who might otherwise have been non-producers, and that we are upon the threshold of many other developments that will still further increase our productive and consuming power.

To this cheering presentation of the facts it is hard to take exception, but those who dissent from it point out that the economic progress of civilized society has always been marked by alternations of prosperity and depression, and that neither engines nor men can be run continuously at high pressure without the risk of a breakdown or an explosion. This generalization is supported by precedent, and while the present period may be a partial exception to an inviolable rule, it cannot be denied that the conservatives have the support of history when they advise caution and call attention to the distention of credit that is such a conspicuous feature of the present situation.

But it must also be admitted that tight money is about the only definitely unfavorable factor that is visible, and that there is some prospect of a relaxation after New Year's, when currency will be flowing back into the banks, and the demand for credit will be seasonally diminished.

It must also be admitted that the advance in money rates which began early in 1928 caused no visible constriction in the year's business. The sharp decline in new financing, which occurred in midsummer, aroused fears that construction would be checked and enterprise discouraged, but that apparently has not been the case, and since midsummer the raising of new capital has increased again. The total of new issues in November, which was $200,000,000 larger than a year ago, brings the aggregate for the first eleven months to approximately the same as in the same period of 1927.

These figures may seem surprising to those who have observed the decline in new bond issues, but, while it has been more difficult to sell bonds, it has been easy to sell stocks, and the great increase in stock issues has more than offset the decline in bonds.

This recovery is one of the most significant items in the business news, for it seems to indicate an enterprise that dearer money does not balk, and though such a conclusion violates an orthodox economic concept, it may be that the confidence in the impossibility of a credit shortage or panic which the Federal Reserve system creates, is mitigating the restricting effects which advancing money rates have traditionally had on business.

It seems unlikely that the present Congress will pass any measures that will be affirmatively injurious to business, and relief is felt at the prospect of its adjournment *sine die* on the 4th of March.

After that we shall probably have a legislative respite of at least two months. This will carry us up to May, and that is about as far ahead as it seems prudent to look at present.

WHAT'S DOING IN INDUSTRY

ABOUT the only industrial center not reporting a pre-holiday lull in the machine market is Chicago, where there are no indications of an immediate let-up. In no case is the depression, slight in most cases, considered more than temporary. In Detroit, where the present lull is most noticeable, most of the automotive shops have shut down for inventory taking, and in addition the influenza epidemic is handicapping what little metal-working activity there is. Employment is still 100,000 over last year's figures at this time, however, although it has been declining for some weeks.

ORDERS and inquiries have fallen off in the New England territory, and further delay in buying is expected until after the first of the year. The outlook for first-quarter business is splendid, however. The same condition holds true for the Indianapolis market, and in the South a holiday quiet is reported, with the future outlook bright. In New York only a slight let-up in the volume of orders is noted, but inquiries hold much promise.

CINCINNATI reports sales at a good level, on the other hand, despite the slight tendency toward a seasonal lull, and inquiries are coming in freely. Metal-working activity in Canada continues on a high level, except for the automotive industry, which is experiencing its seasonal lull, as in Detroit. Locomotive and car orders are keeping many of the big shops there busy. There has been a pick-up also in car orders in the United States, leading to the belief that the railroad situation, the chief dull spot in the 1928 picture, is about to improve. In fact railroad buying of machine tools already shows signs of increasing in several centers, such as Chicago.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CHICAGO

The closing period of the year finds business in the machine tool industry still active, with no indications of an immediate let-up. The approach of the holiday season, which ordinarily produces the effect of a temporary reduction in the volume of orders and inquiries, this year has had no such effect. Representatives of tool building concerns and dealers in machine shop equipment alike report a decidedly unusual situation, in that most plants producing standard tools are working to capacity, and dealers' sales show no diminution in volume. This is attributed to the general industrial activity reported by trade statisticians as prevailing throughout the country.

Recent interviews with Western railroad purchasing agents on the part of a local machinery house executive are said to have resulted in a brighter outlook for railroad buying early next year, three roads having indicated that their 1929 budgets will provide for a material addition to shop equipment.

Demand for used tools continues brisk, prices being well maintained on all standard units. Business for the month of December, predicated on orders thus far booked, will exceed that of the same month last year by a very large percentage.

DETROIT

Detroit is now beginning to feel the full effects of the usual pre-holiday lull. The machinery and machine tool trade is almost at a standstill, and there seems no prospect that things will pick up before sometime in January.

In most cases the automotive plants have shut down for inventory, and in other cases the influenza epidemic has brought about many absences. The men in the trade feel the effects of the disease also and dozens of them are off the job here.

There is a decidedly favorable trend in conditions here in spite of this situation, however. Employment is dropping off steadily of course, this week a drop of about 1,500 being recorded in the Detroit area, but this still leaves a total employment of about nearly 400,000 or about 100,000 ahead of this time last year and 10,000 ahead of the peak for this time of year which was in 1925.

CINCINNATI

Machine tool manufacturers in the Cincinnati district report that while there is some tendency toward a slight seasonal lull, business is holding up well and in the past week sales were at a good level. The general opinion is that the outlook for at least the first three months of the coming year is excellent. Those who care to forecast for a longer period express the opinion that there will be a better market in the coming year than there has been in the year that is drawing to a close.

Selling agents report that business was very good in local and adjacent territory during the past week, considering the season. This branch of the trade takes an optimistic view of the future, members of it stating that there is a good volume of business in sight, from prospects now developed, and that the need of modern equipment is becoming acute with many users of obsolete tools.

In the week there were received an increased number of orders calling for two or three tools, and this is taken as an indication that to some extent orders are about to increase in size, although the sustaining feature of the market continues to be the sale of single tools. A few purchases were made by railroads and concerns in the automotive industry and its allied trades, these being largely confined to single tools.

Inquiries came in freely during the week, from all sections of the country, the great majority of them being from miscellaneous users, whose requirements were generally single tools.

NEW ENGLAND

Orders for machine tools have been less prominent during the current week in the New England section. Inquiries have been correspondingly fewer, and some manufacturers anticipate further delays on prospective business until after the first of the year. Tool builders are not concerned at the situation. The industry this year is entitled to its seasonal interruption, they say, and it cannot in any way be generalized as a depression. The problem confronting manufacturers at present is to maintain their very necessary schedules of production and take the equally important inventories.

The inventory period this year should bring unexpected orders. One builder has discovered already that he will shortly require new gear cutting units, and an order will go out soon after the new year begins. A central Massachusetts company has purchased several machinery units for its plant. Despite the lateness of the year the week showed a good scattering of orders for diversified small machines.

Although inquiries for the week fell off, the collective volume for the month is unusually large. Should only a fair percentage of these embryo orders reach New England plants, they will keep the industry substantially occupied through the spring months. The outlook must be termed splendid.

CANADA

With one or two exceptions, activity in the metal-working industry in Canada continues at a high level. The principal exception is the automobile industry which has recently slackened, as is usual at this season, but the preparations for further manufacture are on a larger scale than ever before.

The plant of the Canadian Locomotive Co., Kingston, Ontario, is taking on about 400 more men to turn out orders for the Canadian National Railway for 30 locomotives. This firm has just secured an order from the Algoma Central and Hudson Bay Railway for two locomotives of the No. 15 Santa Fe type.

The recent improvement in conditions in the Maritime provinces is found reflected in the announcement that the Amherst branch of the Canadian Car and Foundry rolling mills will operate steadily throughout the winter, and that the Enterprise Foundry Co., Ltd., of Sackville, N. B., are constructing an additional unit to their plant to cope with the pressure of business. Then too, the Halifax Shipyards have just been awarded a contract for repairing and overhauling the Imperial Oil tanker "Royalite."

Orders have recently been placed for all the equipment to be installed in the new power plant of the Hudson Bay Mining and Smelting Co., at Island Falls, on the Churchill River, province of Saskatchewan. The contracts were awarded to the Canadian General Electric Co., the Dominion Engineering Co., and the Canadian Westinghouse Co. The latter firm have also secured the contract for the generator for the tenth and final unit of the Queenston-Chippawa development of the Ontario Hydro Electric Power Commission, at Niagara Falls.

INDIANAPOLIS

Evidence of a depression in the machine tool business has been apparent during the last two weeks. The dealers and manufacturers are not concerned particularly, believing that the slump was coming, because of the holiday period. Most of the users are taking inventory, and some are planning to close down for a week around the first of the year. This has had its effect on buying, naturally, since inventories must be kept down.

The general outlook for after the first of the year is particularly bright. Were it not for the holiday season, there doubtless would be continued good business right through. Nearly all the regular buyers are expected to be in the market after the New Year, and, if conditions continue to improve as they have for the past six months, virtually all the soft spots in demand will be wiped out.

Thus far there has only been one industry that has been dissappointing during the early winter. This is the railroad industry, where every effort is being made to curtail expenses. But here, also, there is a ray of hope. Word from various divisional shops throughout the state is to the effect that more men will be hired after the first of the year. One shop, which had been closed down entirely, has just reopened. The roads have been busy and motive power has been kept on the road until repairs were absolutely necessary.

Automobile factory demand is seasonable, but the outlook for the year is good. The automobile body factories are buying their requirements of special machinery both for wood and metal bodies. These industries have been the most prosperous in the state this year, judging from the continued activity.

Demand from the farm implement factories is expected to jump immediately after the New Year. The demand for special coal mining machinery also continues good, as more and more Indiana mines are put in operation.

SOUTHERN DISTRICT

While the holiday season finds machinery and machine tool business rather quiet in the southern district, distributors grow more optimistic daily over the outlook for business the early part of 1929, reporting an increasing volume of inquiries from many of the leading buyers, many of which are certain to develop into orders within the next two or three months Reports also have been very encouraging from salesmen in the field over the early 1929 outlook, and all leading lines are expected to be in good demand. A few orders have been booked for various items for delivery after the first of the year, but most of this business is yet to come. Sales for export also are considered unusually promising for the first few months of the year.

Some fair sales were made the past two

weeks to the lumber and furniture manufacturing industries in the Southeast for equipment that will be installed when the plants shut down for overhauling during the holiday period. This business, however, is not as heavy as it was at this time last year, nor is it likely to be as heavy the first quarter of the coming year as it was for that period in 1928. The furniture outlook, however, seems particularly good next year.

Quite a few sales of fair size are being made in the textile field in this district for new plants now under construction, and there seems little doubt but that business will continue brisk in this field for several months. Railroads are placing but a few scattered orders at present, mainly for heavier equipment, but inquiry is good. Smaller machine shops and garages are doing but little business right now, and their orders are rather few and far between, preference being for used or rebuilt equipment, this comprising one of the few consuming fields in which the 1929 outlook is not very promising.

NEW YORK

There has been little noticeable slowing up in buying of machine tools in the New York market as the end of the year approaches. An equal number report on the one hand that orders are being held for next year's appropriations, and on the other that orders are being placed now to absorb unused appropriations. The week's business placed by representative machine tool dealers and factory agents, while it has not been startling, has on the whole been satisfactory, so that it now seems certain that December will be well up in line with previous months. While the characteristic of the market is still well scattered buying of single tools, one firm reports the receipt of several fair sized orders in the past month, one from a company in Connecticut involving a large number of sensitive drills. Reports reaching here also indicate that some heavy buying has been done in Buffalo in the past month, chiefly by the Houde Engineering Co. and the Curtis Aeroplane and Motor Company.

With a large number of active prospects on hand, most sellers are entering the new year with much confidence.

The General Electric Co. has again inquired for equipment for its radio and refrigerator manufacturing departments, this time chiefly for grinding machines. The New York Central has also been making active inquiry in recent weeks, and has been buying equipment. Scattered orders continue to come from the Wright Aeronautical Corporation to round out the large purchases made last month, and because of the fact that this concern is six months behind in delivery of its motors, it is anticipated that further buying on a large scale will take place in the next few months. R. Hoe & Co. bought some cylindrical grinders in the past week, but has not closed on the engine and turret lathes under consideration. Another source of future business mentioned is the Intertype Co., of Brooklyn, which is moving into a new plant next month.

The Triplex Machine Tool Co. sold a Swiss jig borer to a concern in New England, an Oesterlin Ohio milling machine, a Campbell nibbler, a spring coiling machine and four Mikron gear hobbers, besides a number of small tools and gages.

The Pratt & Whitney Co. reports the sale of: three jig borers, four engine lathes, a vertical shaper, two thread millers, and a hand centering machine. The Niles Tool Works Co. sold a steam hammer, a wheel press, and a boring mill to industrial concerns, while the machinery division of the company sold two Ransom grinders, four Morris radial drills, and one upright drill. The Niles-Bement-Pond Co. will continue to act as selling agents for the Niles Tool Works Co., which has been merged with the Hooven, Owens and Rentschler Co. under the name of the General Machinery Corporation.

Aeronautical Notes

American Cirrus Engines, Inc., recently organized for the manufacture of the British Cirrus airplane engine in this country, is to start production of the British Mark III engine at a plant in Belleville, N. J. A. G. Lloyd, formerly assistant production manager of the Wright Aeronautical Corporation, of Paterson, N. J., will be in charge of production for the new company. He will be assisted by C. A. de Giers, consulting aeronautical engineer, and Prof. Alexander Klemin, director of the Guggenheim School of Aeronautics.

The General Aero Corporation, of New York, has been formed as a holding and operating company for the Swallow Airplane Co. and the Cessna Airplane Co., both of Wichita, Kan. It is understood also that a propeller and engine company also have come under the control of the new corporation.

The American Aeronautical Corporation, 230 Fifth Ave., New York, has taken over the American rights for the manufacture of the Marchetti seaplanes and amphibians, of the type used by the Italian flyer de Pinedo in his world flight last summer. Paul G. Zimmerman is chief engineer for the corporation.

At the annual meeting of the stockholders of the Warner Aircraft Corporation, W. A. Warner, president, announced that production in 1929 was estimated at 1,000 motors, with orders for 610 motors on hand. Additional property will be purchased and a new plant erected by March 1 to handle the increased production, Mr. Warner said.

The Sperry Gyroscope Co., of Brooklyn, N. Y., builder of aeronautical and navigating instruments, has been purchased by North American Aviation, Inc., a $25,000,000 holding corporation, which already controls the Curtis Aeroplane and Motor Co., Curtis Flying Service, Transcontinental Air Transport, National Air Transport, and the Curtis-Robertson Aircraft Corporation. The chief development work will center on the Sperry automatic gyro control of airplanes and a new Diesel engine for aeronautical use. Elmer A. Sperry, founder of the Sperry company, will remain with the organization, but will devote more of his time to research.

Five Western Oil Tool Plants Merged with Jackson Pump

The Byron Jackson Pump Co., of San Francisco and Los Angeles, has purchased five of the largest oil tool manufacturing concerns on the Pacific Coast and has named the new combine, Byron Jackson, Inc. Products will be manufactured under three divisions, oil tools, disk bits, and pumps. The concerns bought are: the Wilson and Willard Manufacturing Co., the Wilson Oil Tools Corporation, the Rotary Disc Bit Co., the U. S. Tool Co., and the Craig Oil Tool Co. The Wilson and Willard concern will cease to exist and the Wilson Oil Tools Corporation will function as the oil tools division. The Wilson factory at Los Angeles will remain the factory of this division. The disc bit division of Byron Jackson, Inc will comprise the three last named concerns and will have the same executives as the former companies. Both the disc division and the Jackson pump division will be located in a new plant in Los Angeles, which has triple the capacity of the former Jackson plant. The personnel of the two Wilson firms will also remain the same. The original plant of the U. S. Tool Co. at Long Beach will be converted into a field service depot for the reconditioning of tools.

Large Shipyard Merger Planned

Negotiations for a $22,000,000 merger of six shipbuilding concerns in Brooklyn, Hoboken and Staten Island, all in the New York Harbor, are under way, under the name of United Dry Dock, Inc. The yards involved include Morse's Dry Dock and Repair Co., of Brooklyn; James Shewan & Sons, Brooklyn; Theodore E. Crane Sons Co., Brooklyn; W. & A. Fletcher, Hoboken; New York Harbor Dry Dock Co., Tompkinsville, S. I.; and the Staten Island Shipbuilding Co., Mariners Harbor, S. I. One of the purposes of the merger is to stabilize dry dock rates in New York, which are said to be the lowest in the country.

Business Items

The Brown Instrument Co., of Philadelphia, has moved its New York office from 50 Church St. to Room 1502 Roebling Bldg., 117 Liberty St., in order to provide larger quarters.

The Spartan Saw Works, Springfield, Mass., is to build a large addition to its present plant, increasing the present capacity by 50 per cent. This is the second extension that the company has made since the War.

Orders on hand received by the Canadian Car & Foundry Co., Montreal, amount to $22,250,000, compared with $2,816,000 a year ago, and it is expected that the company will do about $30,000,000 worth of business in the coming year.

The American Shipbuilding Co., of Cleveland, has sold its Milwaukee (Wis.) plant, known as the Milwaukee Drydock Co., to real estate investors. The plant consisted of a small drydock and a machine shop. All the equipment at Milwaukee will be disposed of and operations there cease.

Negotiations have been completed for the merger of the Selden Truck Corporation, Rochester, N. Y., with the Hahn Motor Truck Co., Allentown, Pa., effective Jan. 2. Both companies have been in business more than 25 years. Manufacturing operations will be centralized at Allentown, but the Rochester plant will also be maintained.

Directors of the Dallas Brass & Copper Co., of Chicago, have approved a plan to merge with the Republic Brass Corporation, which was recently announced in the *American Machinist*. The Dallas concern operates the only non-ferrous rolling mill in Chicago. It will continue to operate as a separate unit under its own name, and the direction of the same management.

The Hill Clutch Machinery & Foundry Co., of Cleveland, Ohio, has appointed the following dealers: Lombard Iron Works, Augusta, Ga.; the Murray Co., Dallas, Tex. (and adjacent territory); D. de Treville, Savannah, Ga.; Cameron & Barkley, Charleston, S. C., and Wm. G. Moorman, Buffalo.

The Hisey-Wolf Machine Co., of Cincinnati, Ohio, manufacturer of electric drills, grinders, and buffers, has recently opened a branch office at 210 Machinery Hall, 549 W. Washington Blvd., Chicago. The office will be in charge of Roy D. Haworth. A complete stock of Hisey-Wolf products will be carried.

The Bemis & Call Co., Springfield, Mass., has purchased the wrench business of the Coes Wrench Co., of Worcester, Mass., and is removing production of the Coes wrenches to Springfield, where both lines will be manufactured and sold under the same trade marks as before. J. C. McCarty & Co., New York, will be the selling agents in the East, and John K. Wilson & Co., of Baltimore, will continue to represent the company in the South.

The foundry and machine plant of W. A. Savage & Co., Knoxville, Tenn., which was acquired recently by W. M. Fulton, 820 Temple Ave., that city, and associates, is being enlarged and generally improved throughout for the manufacture of machinery and equipment used by flour mills, coal mines, contractors, waterworks plants, etc., and the new owners expect to be operating the plant actively early in the coming year.

The Gamewell Co., Newton Upper Falls, Mass., has purchased the Holtzer-Cabot Electric Co., Boston, Mass., for a price said to reach $2,000,000. Details of the deal have not been fully completed, but it is said stockholders of the Holtzer-Cabot company will receive $166.67 for their shares. Recently the Gamewell Co., manufacturer of signal systems, voted an increase in capital stock from 67,500 shares to 150,000 shares, presumably to make way for this deal.

The Peter Smith Heater & Manufacturing Co., manufacturer of pressed steel parts, reports that it has booked 62 per cent more orders during the fiscal year ending Dec. 1, 1928, than in the previous year. The number of customers more than doubled. Orders received during the months of October and November showed an increase of 40 per cent over the average for several months previous. Shipments have increased steadily since May.

The Hunter Saw & Machine Co., of Pittsburgh, Pa., announces that Moyer, White & Co., 2644 Lenox Ave., Detroit, have been appointed exclusive agents in the Detroit territory for the company's line of metal-cutting saws and machines, pneumatic rivet sets, and hardened steel specialties. James A. Lenfesty, Cambridge Arms, N. Charles and 34th Sts., Baltimore, Md., has been appointed agent in the Baltimore and Washington territory.

The Duff Manufacturing Co., of Pittsburgh, manufacturer of industrial and railroad jacks and drop forgings, has taken over the business of A. O. Norton, Inc., and has changed the name to the Duff-Norton Manufacturing Co. The capital stock of A. O. Norton, Ltd., of Canada, has also been obtained. Management of the Duff Company will be unchanged, with T. A. McGinley remaining as president. A. L. Humphrey, president of the Westinghouse Airbrake Co., is one of the vice-presidents.

The Dominion Bridge Co., Ltd., has acquired control of the Riverside Iron Works, of Calgary, Alberta, for an amount approximating $500,000. An addition to the present plant will be constructed in the spring at a cost of about $300,000. The company has also purchased a site of 13 acres adjacent to the Riverside Iron Works. According to President G. H. Duggan, business this year has created a record output, and advance bookings of the company are sufficient to keep all plants busy for several months.

According to a statement just issued by officials of the Advance Rumely Co., farm implement, tractor and machinery manufacturer, of LaPorte, Ind., the net earnings for 1928 will reach $750,000 and prospects are good for 1929. The company at present is employing 300 more men than it did at this time last year and the low level for this year in employment was passed Nov. 1, when 1,114 men were on the payroll. Men now are being added to the rolls steadily. The return will equal almost exactly a year's dividend requirements on the new 6 per cent preferred stock. No dividends will be declared, however, this year, because of the building program of the company.

Additional men are to be employed by the Forse Equipment Co., Anderson, Ind., manufacturer of a newly-acquired special line of machinery and equipment for dry cleaning plants. The company will continue its manufacture of practice claviers and automatic driving machines. The company has just been incorporated with a capital stock of $100,000 to take care of the increased business. The incorporators are W. H. Forse, H. D. Forse and Ethel E. Forse. Part of the new line was acquired earlier in the year from the DeVasher Co. of St. Louis.

At a meeting of the board of directors of the Black & Decker Manufacturing Co., Towson, Md., December 18, the regular quarterly dividend of 50 cents per share of preferred stock was declared. At the same time, the quarterly dividend rate on the common stock was increased from 25 to 30 cents per share. The increased dividend on the common stock is a reflection of the earnings and general condition of the company. Domestic and foreign sales for the last quarter of the calendar year were 20 per cent greater than for the same period last year. The net gain for the year for all companies, including the Canadian and the English ones, was 17½ per cent over that of the previous year, and inclusive of the net sales of the Van Dorn Electric Tool Co., of Cleveland, a subsidiary, the gain in net sales amounted to 47 per cent over that of 1927. The directors also authorized the erection of a new factory building at Towson, in order to add 40,000 sq.ft. of floor space to the present facilities. Work on the building will begin in middle January.

Personals

R. L. MATTHEWS has been added to the sales force of the Chicago office of the Wagner Electric Corporation, of St. Louis.

J. PESKINE, general manager of Stokfis & Fils, Paris, France, sailed from New York on December 20 after a visit of several weeks to various production shops throughout the United States.

ARTHUR F. MOUL has been elected a director and secretary of Samuel C. Rogers & Co., Buffalo, N. Y., makers of machine knife and saw grinders. Mr. Moul joined the Rogers organization in June, 1924, and has been manager for the past three years.

CHARLES L. RICE, manager of the Hawthorne Works of the Western Electric Co., Inc., Chicago; WILLIAM H. MEESE, manager of the Point Breeze (Md.) plant, and S. S. HOLMES, of the Kearny (N. J.) Works, have been elected vice-presidents.

CHARLES H. MILLEN, general superintendent of the E. B. Eddy Co., Hull, Que., has resigned on account of ill health, after nearly forty years in the employ of the company. Mr. Millen is 60 years of age and is a son of the late George H. Millen, who was president of the company at the time of his death a few weeks ago.

F. EDWARD O'NEILL has been elected vice-president and manager of the Diesel Division of the Fulton Iron Works Co., of St. Louis. In 1909, he was in charge of the corporation's shops when the company built its first Diesel engine, although in recent years he has been in charge of the New York office.

VICTOR M. DRURY, of Montreal, prominent in the business life of Canada as a member of various important directorates, including the Canadian International Paper Co., and Canadian Vickers, Ltd., has been chosen president of the E. B. Eddy Co., of Hull, Quebec, to succeed the late George H. Millen.

HENRY C. OSBORN, president of the American Multigraph Co., Cleveland, has been appointed chief of the Cleveland Ordnance District of the U. S. Army in place of Col. Frank A. Scott, chairman of the board of the Warner & Swasey Co., who recently resigned. ALEX C. BROWN, president of the Industrial Brown Hoist Corporation, has been made assistant ordnance chief of the district.

Obituaries

WILLIAM CHASE GREENE, vice-president and works manager of the Builders Iron Foundry Co., Providence, R. I., died on Dec. 13 after a long illness. He was 77 years old.

HENRY B. WHITNEY, superintendent of the axle division of the General Motors of Canada, Ltd., Walkerville, Ont., died on Dec. 3, at the age of 48 in a Windsor (Ont.) hospital from an attack of pneumonia. He was formerly connected with the Russell Motor Car Co., at Toronto, and the Davenport Machine and Tool Co., of Rochester.

GEORGE W. BIGELOW, chief engineer of the Bigelow Boiler Works, New Haven, Conn., and connected with that concern for 50 years previous to his retirement, died December 14 in that city. Mr. Bigelow was well known in the engineering field and gained outstanding distinction for many of his inventions. He designed and built the first reversible engine used in submarine boats by the United States. He has been engaged in the arrangement of a 13-month calendar. He was 97 years old and a brother of the late Gov. Hobert B. Bigelow.

MARTIN HAWKE, managing director of the Carborundum Co., Ltd., Manchester, England, died at the age of 66 on Dec. 20 after a brief illness. He had been with the company since 1900, first as continental representative, and then as managing director of the Birmingham plant, which was built in 1912. He is survived by his widow and two sons, both of whom are associated with the Carborundum Co.; Irving Hawke, sales manager of the English branch, and Clarence E. Hawke, sales engineer for the refractory division at Perth Amboy.

FRANK H. PAGE, founder and president of the National Equipment Co., manufacturer of confectionery machinery in Springfield, Mass., and treasurer of the Van Norman Machine Tool Co., also of that city, died Dec. 19 of heart disease in his home at Longmeadow, a suburb of Springfield. He was graduated from Massachusetts Institute of Technology in 1885. He was associated with George Munsing in starting the Northwestern Knitting Co. in Minneapolis. In 1891 he started the Confectioners' Machinery & Manufacturing Co. in Springfield and became its president and general manager.

Forthcoming Meetings

Western Metal Congress and Western States Metal & Machinery Exposition. Held in Los Angeles, Jan. 14-18, under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

Society of Automotive Engineers. Annual meeting, Jan. 15-18, Book-Cadillac Hotel, Detroit. C. E. Haywood, in charge of meetings, 29 W. 39th St., New York City.

American Management Association. Production Executives' conference, Feb. 27-28 and Mar. 1, at the William Penn Hotel, Pittsburgh, Pa. Oscar Grothe, vice-president in charge of the production executives' division, c/o White Sewing Machine Co., Cleveland, Ohio.

American Society of Mechanical Engineers. Regional meeting in Knoxville, Tenn., March 21-22, 1929. W. R. Woolrich, professor of mechanical engineering, University of Tennessee, Knoxville, in charge of program.

American Management Association. Marketing Executives' Conference, April 3-4, at the Hotel Gibson, Cincinnati, Ohio. George R. Cain, vice-president in charge of the marketing Executives' division, American Management Association, 20 Vesey St., New York City.

American Society of Mechanical Engineers. Semi-annual meeting, July 1-4, 1929, in Salt Lake City, Utah. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

A SEASONAL slowing-down in demand is at present noticeable in the pig-iron market. Prices, however, remain steady, owing to smallness of reserve stocks at furnace and melters' yards. Steel buying also is seasonally slower than during recent weeks; the same being true of practically all major metals. Mill shipments, on the other hand, continue in large volume on steel pipe, automotive and agricultural implement material, sheets, tin plate, wire, rails and track supplies. Outstanding price declines of the week were those which occurred in tin, antimony, solder, babbitt metal, scrap non-ferrous metals, linseed oil and coke.

(All prices as of Dec. 21, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	25.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	16.50@17.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	22.26
PITTSBURGH, including freight charge ($1.75) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.35	3.25	3.90*
No. 12	2.06@2.15	3.40	3.30	3.95*
No. 14	2.15@2.25	3.45	3.35	4.00*
No. 16	2.25@2.35	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.55@2.65	3.60	3.40	4.00
No. 22	2.70@2.80	3.75	3.55	4.15
No. 24	2.75@2.85	3.80	3.60	4.20
No. 26	2.85@2.95	3.90	3.70	4.30
No. 28	3.00@3.10	4.50	3.85	4.45
Galvanized				
No. 10	2.70@2.80	3.95	3.75	4.25
Nos. 12 to 14	2.80@2.90	4.05	3.85	4.35
No. 16	2.90@3.00	4.15	3.95	4.45
No. 18	3.05@3.15	4.30	4.10	4.60
No. 20	3.20@3.30	4.45	4.30	4.75
No. 22	3.25@3.35	4.50	4.35	4.80
No. 24	3.50@3.60	4.65	4.45	4.95
No. 16	3.65@3.75	4.90	4.70	5.20
No. 28	3.90@4.00	5.15	4.95	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Glav.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—⅛	¼	⅜	½	¾	1	1⅛	1¼
		Price per Foot							
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049"	18	.17	.18	.19	.20	.21	.23	.25	
.065"	16	.19	.20	.21	.22	.23	.25	.27	
.083"	14	.20	.22	.23	.24	.25	.27	.29	
.095"	13	.21	.23	.25	.26	.27	.29	.31	
.109"	12	.22	.24	.26	.27	.28	.30	.32	
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33	
.134"	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	4.00†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$@$\frac{1}{2}$-in. thick. †250 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; $\frac{1}{8}$, 7.85c.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			16.75
Tin, Straits, pigs, New York			53.00
Lead, pigs, E. St. Louis	6.35	New York	8.00
Zinc, slabs, E. St. Louis	6.35	New York	8.00

	New York	Cleveland	Chicago
Antimony, slabs	12@13	12.75	14.25
Copper sheets, base	25.00	25.00	25.00
Copper wire, base	21.37½	21.25	17.87½*
Copper bars, base	23.50	23.50	24.00
Copper tubing, base	26.37½	26.37½	26.37½
Brass sheets, high, base	20.50	20.50	20.50
Brass tubing, high, base	25.37½	25.37½	25.37½
Brass rods, high, base	18.25	18.25	18.25
Brass wire, high, base	21.00	21.00	21.00

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	25.00*	24.30	24.30
Zinc sheets (casks)	10.00@10.50	11.00	10.11
Solder (½ and ½)	35.00	35.00	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade			67.00
Commercial genuine, intermediate grade			53.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			12.25

*Delivered.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold rolled	53.00	40.00†
Tubing	75.00*	90.00
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Cold drawn.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper	14.25 @14.37½	13.75	12.75 @13.25
Copper, heavy, and wire	13.00 @14.00	13.00	12.12½@12.50
Copper, light, and bottoms	11.75 @12.25	11.00	11.00 @11.50
Heavy lead	5.12½@ 5.37½	6.25	4.75 @ 5.25
Tea lead	3.50 @ 4.00	4.25	3.75 @ 4.25
Brass, heavy, yellow	7.75 @ 8.00	8.50	8.00 @ 8.50
Brass, heavy, red	10.50 @11.00	....	10.25 @10.75
Brass, light	6.25 @ 6.75	6.75	6.75 @ 7.25
No. 1 yellow rod turnings	8.75 @ 9.25	9.50	8.75 @ 9.25
Zinc	3.00 @ 3.50	3.25	3.00 @ 3.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†	.16@ .16½	38.00 per M	.16
Sal soda, per lb.	.02	.02	.02
Roll sulphur, per lb.	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.108	.11	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.30	.36	.35
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30– 5%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade	50%	50–10%	50%
Second grade	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales or less.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0325	$0.0325	$0.0324
Cold drawn shafting	per lb.	.034	.034	.04
Brass rods	per lb.	.1825	.1825	.165
Solder (½ and ½)	per lb.	.35	.3575	.3675
Cotton waste, white	per lb.	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia	per 100.	3.59	3.59	3.10
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.30	.30	.27
Belting, leather, medium	off list.	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs	off list.	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper	$4.05	$4.29	$4.29
Emery cloth	20.22	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper	2.04	2.04	2.04
Cloth	3.59	3.59	3.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.75@2.85
Coke, prompt foundry, per net ton	Connellsville,		3.75@4.50
White lead, dry or in oil	100 lb. kegs	New York,	13.25
Red lead, dry	100 lb. kegs	New York,	13.25
Red lead, in oil	100 lb. kegs	New York,	14.75

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts, square heads and nuts:	Full Kegs or Cases
Up to ¾ x 6-in.	55%
Larger, up to 1 x 30-in.	50%
1⅛ and 1¼ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square or hexagonal, blank or tapped, up to 1-in. incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb.	$3.50*
Rivets, button and cone head:	
Small, including ⅞-in. dia.	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Ind., Brazil—Mayer Bros.—for plant machinery and equipment for the manufacture of power hammers to cost $50,000.

Ind., Fort Wayne—S. F. Bowser Co.—machinery and equipment to cost $50,000 for proposed chromium plating plant.

Mass., New Bedford — A. Bellotti, 682 Acushnet Ave.—machine shop equipment for aeroplane repair shop and garage.

Opportunities for Future Business

Ala., Birmingham—Pullman Car & Mfg. Co., 79 East Adams St., Chicago, Ill., have acquired a site here and plans the construction of a car building plant. Estimated cost $1,000,000.

Ark., Helena—Wood Parts Corp., West Helena, awarded contract for addition to plant to increase capacity here. Estimated cost $75,000.

Calif., Santa Clara—Pacific Mfg. Co. will build a 1 story, 385 x 488 ft. planing mill, etc. Estimated cost $250,000.

Conn., Bristol—Wallace Barnes Co., 30 Main St., plans a 1 story addition to steel plant. Estimated cost $50,000. Private plans.

Conn., Danbury—Anderson Nash Corp., 143 White St., awarded contract for a 1 story, 70 x 120 ft. sales and service station on West St. Estimated cost $45,000. Noted Dec. 13.

Conn., Middletown—Wilcox, Crittenden & Co., 3 South Main St., will not construct foundry as previously reported. This corrects report in Nov. 29 issue.

Ill., Aurora — F. E. Davidson, 53 West Jackson Blvd., Chicago, Archt., will receive bids in January, for the construction of a factory here for Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago.

Ill., Harvey—Buda Mfg. Co., L. M. Viles, Pres., 154th St., manufacturers of hand cars, etc. awarded contract for the construction of a 1 story engine assembly building. Estimated cost $65,000. Perkins, Chatten & Hammond, 160 North La Salle St., Chicago, Archts.

Ill., Moline—Frank Foundries Corp., 125 21st St., awarded contract for a 1 story, 100 x 160 and 70 x 100 ft. foundry and shipping buildings.

Ia., Des Moines — J. I. Case Thresher Machine Co., 102 8th St., awarded contract for a 3 story, 40 x 106 ft. addition to plant. Estimated cost $80,000. Noted Oct. 4.

Ia., Marshalltown — Gra-Iron Foundry Corp. awarded contract for a 1 story, 116 x 204 ft. foundry. Estimated cost $50,000.

Me., Cape Elizabeth (mail Portland)—O. I. Emerson, 10 Cottage St., is preparing preliminary sketches for a 1 story, 50 x 160 ft. repair and service garage. Owners name withheld.

Mass., Charlestown (Boston P. O.) — J. Staffieri, 358 Medford St., awarded contract for a 1 story repair and service garage, etc. Estimated cost $45,000.

Mass., Falmouth—Wood Lumber Co., J. B. Miskell, Mgr., will build a 1 story addition to work shop. Private plans.

Mass., New Bedford—New Bedford Brass Foundry, 42 Front St., awarded contract for a 2 story addition to foundry on Pine St.

Mass., Sheffield — Town, D. N. Smith, Chn. of Building Committee, awarded contract for the construction of a 1 story repair and service garage on Main St. Estimated cost $50,000.

Mass., South Boston (Boston P. O.) — Andrew Sq. Terminal Co., Inc., 53 State St., Boston, is having plans prepared for the construction of a 3 story, 200 x 300 ft. garage, etc., at Dorchester Ave. and Dexter St., here. Estimated cost $3,000,000. R. A. Stowell, 184 Boylston St., Boston, Archt. H. S. Cleverdon, 46 Cornhill, Boston, Engr.

Mass., Worcester—D. F. Daly, 1053 Main St., is having plans prepared for the construction of a 1 story, 100 x 135 ft. repair and service garage, etc. on Madison St. Estimated cost $60,000. G. C. Walcott, 52 Franklin St., Archt.

Mich., Detroit—Federal Mogel Co., manufacturers of automobile accessories, awarded contract for a 1 story factory. Estimated cost $60,000.

Mich., Detroit—Federal Motor Truck Co., Federal Ave., is receiving bids for a 2 story factory. Estimated cost $250,000. F. J. Winter, 309 Grand River Ave., Archt.

Mich., Detroit—Murray Body Corp. of America, 1424 Aberle St., awarded contract for a 6 story, 350 x 525 ft. plant on Russell St.

Mich., Jackson — Jaxon Steel Products, Div. General Motors Co., awarded contract for a 1 story, 70 x 217 ft. Estimated cost $150,000.

Mo., Kansas City—Kansas City Power & Light Co., 1330 Grand Ave., awarded contract for a 4 story, 125 x 142 ft. garage at 14th and Wyandotte Sts. Estimated cost $150,000.

Mo., St. Louis—Century Electric Co., E. S. Pillsbury, Pres., 1806 Pine St., awarded contract for a 1 story, 242 x 262 ft. foundry at 3739 Market St.

Mo., St. Louis—J. A. McBride, c/o J. A. McBride Mechanical Equipment Co., 2639 Locust St., awarded contract for a 1 story, 177 x 200 ft. truck body plant at 4115 Forest Park Blvd. Estimated cost $75,000. St. Louis Body & Equipment Co., lessee. Noted Dec. 13.

N. J., Lambertville — Hobson Flatware Co., Lansdale, Pa., awarded contract for the construction of a factory for the manufacture of knives, forks and spoons. Estimated cost $60,000.

N. J., Maplewood—Kroydon Co., Burnett Ave., will build a 1 story, 30 x 150 ft. addition to factory for the manufacture of golf clubs on Burnett Ave. Estimated cost $40,000. D. A. Hopper, 22 Ridgewood Ave., Irvington. Archt.

N. J., Newark—Owner, c/o F. Koenigsberger, 48 Walnut St., will receive bids about Jan. 15, for a 3 story, 50 x 200 ft. garage. Estimated cost $150,000.

N. J., North Bergen—Leo Weltersbach, 236 Baldwin Ave., Jersey City, awarded contract for a 1 story, 125 x 130 ft. cutlery factory at Harriman Pl. and Burr Ave., here. Estimated cost $40,000.

N. J., Paterson—Letz & Katz, 617 Broadway, will build a 1 story, 100 x 400 ft. service station at 35th and Market Sts. Estimated cost $150,000. Coleman & Haloran, 132 Market St., lessee.

N. Y., Brooklyn—A. R. M. Holding Corp., L. Moss, Pres., 32 Court St., will build a garage at Hoff St. and B. B. Ave. B. W. Dartman, 66 Court St., Archt. Noted Nov. 22.

N. Y., Brooklyn—M. Bergrenn, 552 Ovington Ave., will build a 2 story, 80 x 81 ft., garage at 64th St. and 7th Ave. Estimated cost $40,000. W. E. Martin, 9401 5th Ave., Archt. Noted Dec. 13.

N. Y., Brooklyn — Philip Gundoff, 427 New York Ave., plans the construction of a garage at Empire Blvd. and New York Ave. Estimated cost $40,000. H. J. Nurick, 44 Court St., Archt.

N. Y., Brooklyn—Lawton-Stevens Co., 427 Marcy Ave., awarded contract for the construction of a shop at 78 Lorimer St. Estimated cost $25,000.

N. Y., Buffalo—Worthington Pump & Machinery Co., Clinton and Roberts Sts., awarded contract for the construction of a plating plant. Estimated cost $40,000.

N. Y., Hastings-on-Hudson (br. Yonkers)—Hastings Pavement Co., 25 Broad St., awarded contract for the construction of a plant and machine shop on Railroad Ave. Estimated cost $40,000.

N. Y., Richmond Hill (br. Jamaica)—Suburban Bronze & Iron Co., 101st St. and Atlantic Ave., Queens Village, plans the construction of a 2 story, 100 x 140 ft. factory at 129th St. and 94th Ave., here. Estimated cost $90 000. Koch & Wagner, 32 Court St., Brooklyn, Archts.

O., Akron — Goodyear Zeppelin Corp. awarded contract for a 325 x 1,200 ft. hangar including work shop, etc., at Municipal Airport. Estimated cost $2,000,000.

O., Columbia—Jaeger Machine Co., 520 Dublin Ave., will soon receive bids for a 2 story factory at 518 Dublin Ave. Estimated cost $40,000. Bassett & Tresselt, 257 East Broad St., Archts.

O., Euclid (br. Cleveland)—Chase Brass & Copper Co., 236 Grant Ave., Waterbury, Conn., will soon award contract for the construction of a factory, here. Estimated cost $1,000,000. Austin Co., Euclid Ave., Cleveland, Archt.

Pa., Aspinwall (mail Pittsburgh)—Pittsburgh Heater Co. will build a 1 story, 40 x 100 ft. factory, here. Estimated cost $40,000. Private plans.

Pa., Canonsburg — Continental Can Co. will build a 2 story, 100 x 180 ft. addition to plant. Estimated cost $150,000. Franciso & Jacobus, 511 5th Ave., New York, Archts.

Pa., Nemacolin—Youngstown Sheet & Tube Co., Stambaugh Bldg., Youngstown, O., is having plans prepared for the construction of a coal cleaning plant here. Estimated cost $1,000,000. Allen & Garcia, 332 South Michigan Ave., Chicago, Archts. Noted Mar. 22.

Pa., Philadelphia—Pennsylvania Flexible Metallic Tubing Co., Broad and Race Sts., awarded contract for a 2 story, 45 x 125 ft. addition to factory at 13th and Elmwood Sts. Estimated cost $45,000.

Pa., Pittsburgh — F. J. Kress Box Co., 2930 Liberty Ave., awarded contract for a 1 story, 250 x 400 ft. box factory on Penn Ave. Estimated cost $500,000.

Tex., Beaumont— Kansas City Southern Ry. Co., Kansas City, Mo., is having plans prepared for terminal improvements including shop facilities, etc. Estimated cost $1,000,000. A. N. Reece, Ch. Engr.

Tex., Galveston—U. S. Government, War Dept., Washington, D. C., plans extensions and improvements to flying field, including machine shops, etc., here. Estimated cost $35,000.

Tex., Houston—A. C. Burton & Co., 1402 Main St., plans the construction of a 3 story, 139 x 150 ft. garage on Milam St. Estimated cost $150,000. J. Finger, Democratic Bldg., Archt.

Wis., Milwaukee—Western Metal Specialty Co., 30th St. and Calhoun Pl., awarded contract for addition to factory for the manufacture of sheet metal parts.

B. C., Vancouver—Consolidated Mining & Smelting Co. Ltd. of Canada, Trail, plans the construction of a smelter and refinery, here. Estimated cost $5,000,000.

Ont., Fort Erie—Horton Steel Works, C. H. Scheman, Mgr., plans addition to factory on Gilmore St. Estimated cost $50,000. Private plans.

Ont., Hamilton—Toronto, Hamilton & Buffalo Ry. Co., is having plans prepared for the construction of new machine shops, etc. Estimated cost $1,000,000. R. L. Latham, Ch. Engr.

Sask., Regina — Prest-O-Light Battery Co. plans the construction of a plant. Estimated cost $30,000.

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The Golden Scrap Heap!

The industrial concerns of today that have grown into giants of industry, owe much to a policy of constantly scrapping yesterday's tools for the tools of today. Why? To increase efficiency and reduce costs. The greater the success—the greater the scrap heap!

The fact that recently designed machine tools cut man-time in production (sometimes to one-tenth of former costs) must impel you to weigh seriously this question of modern equipment.

NEW MACHINE TOOLS
- Reduce repair costs, supervision, and inspection
- Eliminate re-operation
- Save floor space

MACHINE TOOLS

The Master Tools of Industry

Modern Equipment Increases Profits

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION

THE JOHNSON FRICTION CLUTCH

As Used

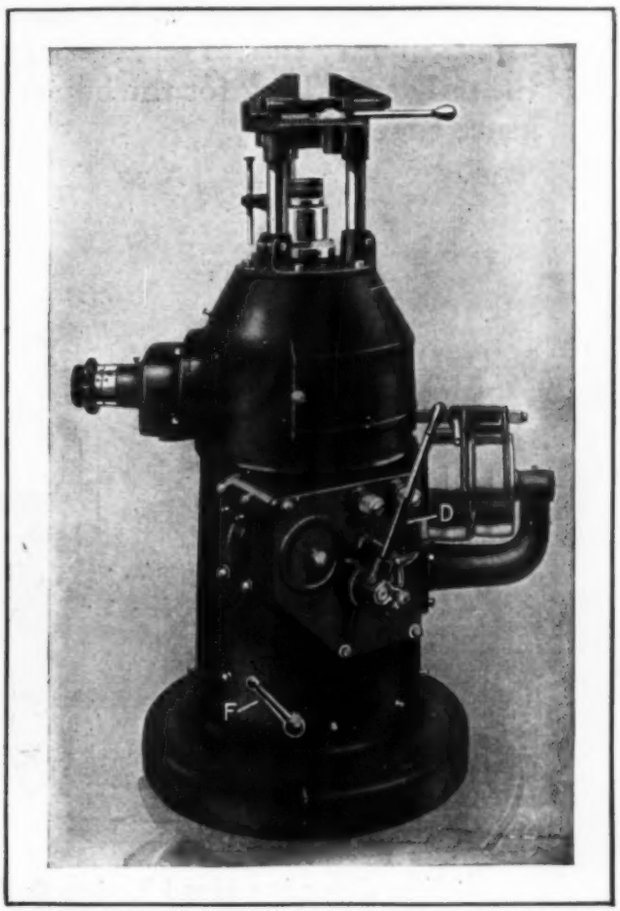
On the Wicaco Continuous Oil Groover

Here's another capable Oil Groover adopting the JOHNSON Friction Clutch. On this Wicaco Continuous Oil Groover the No. 4 JOHNSON Single Clutch is used. The clutch is installed on the main drive, and is giving excellent satisfaction.

Single Clutch
Pulley Mounted

Clutch used instead of tight and loose pulley. Operated 3,000 times a day by foot power.

Single Clutch—Exterior



COURTESY: Wicaco Screw & Machine Works, Inc., Philadelphia, Pa.

Particularly well adapted for Oil Groovers is the JOHNSON Clutch. Compact. Neat. Powerful. Nicely balanced. Clatter-free. Trouble-free. Prompt-start. Instant-stop. Matchless service. Hundreds of thousands running busily daily. Let our illustrated bulletins tell you all. Equip with JOHNSONS.

Write for Blue Catalog

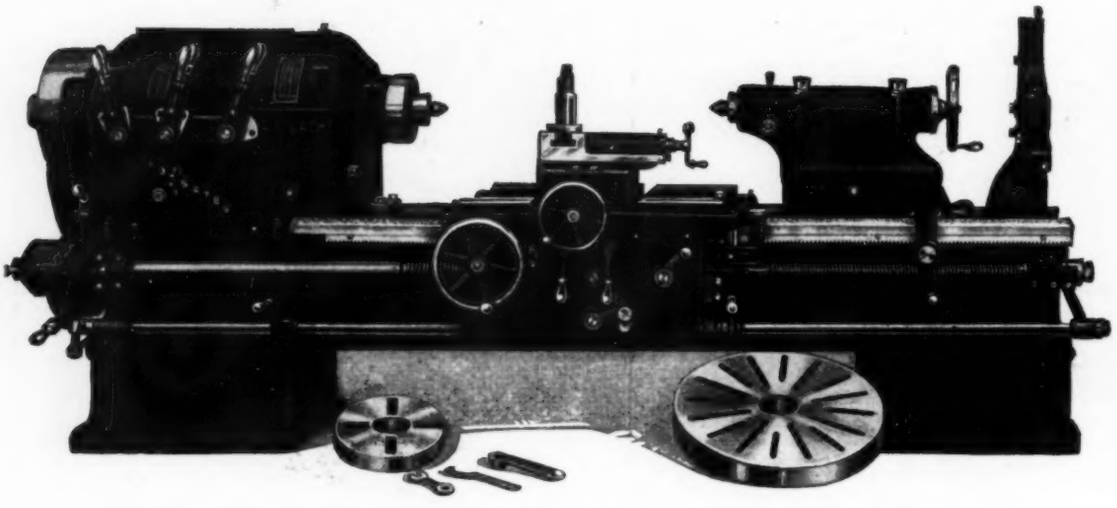
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

Dollars and Sense

They should go together. Particularly in buying, dollars and sense should be used together. Then you are sure of getting your money's worth.

Far too often, however, the dollars overshadow the buyer's sense. It is easy enough to buy the cheaper of two articles. That is the natural thing to do. Whether or not it is the sensible thing to do is another matter.

In some cases it may be the sensible thing to buy on price. In others quality should receive first consideration. In either case the only safe thing for the buyer to do is to use both dollars and sense together.



27-in. Selective Head Lodge & Shipley Engine Lathe

The Lodge & Shipley

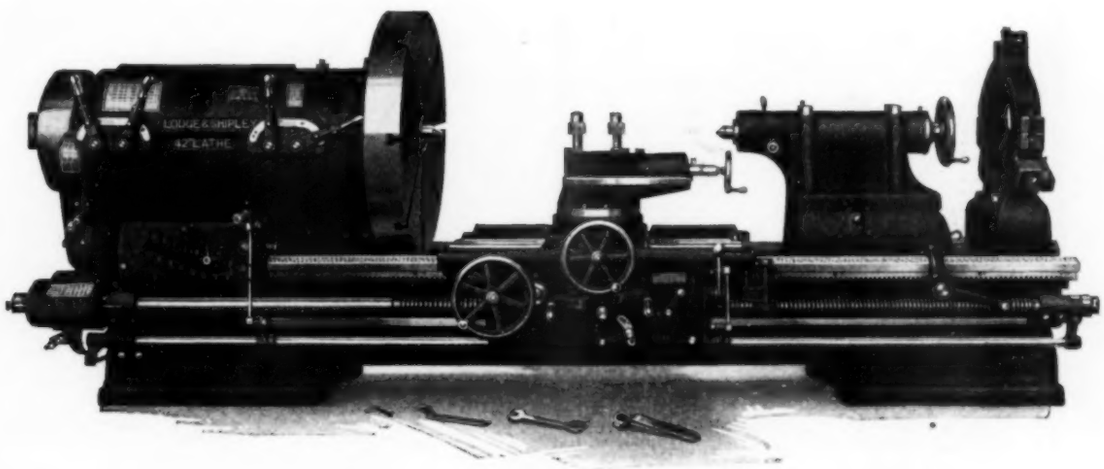
Cincinnati,

In buying lathes you have to use sense when spending your dollars. Lathes are in that class where quality should receive first consideration.

A low price does not necessarily mean a low cost. Usually it means less productive capacity, less accuracy and more breakdowns and repair bills.

The question arises if you can afford to buy lathes on price. Using dollars and sense together will tell you to buy on quality.

Our catalog does not mention price. But it does say quite a bit about quality. We will gladly mail you a copy.

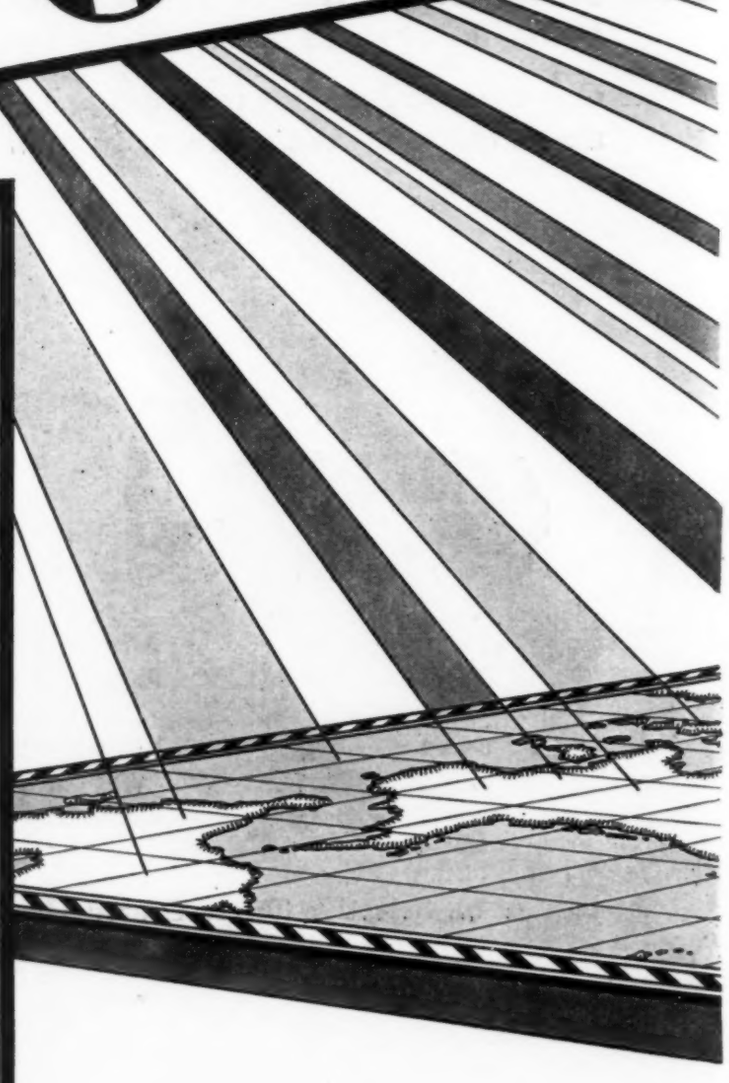


42-in. Selective Triple Geared Head Lodge & Shipley Engine Lathe

Machine Tool Company

Ohio

SERVICE ON MILLING ALL OVER



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CINCINNATI MILLERS

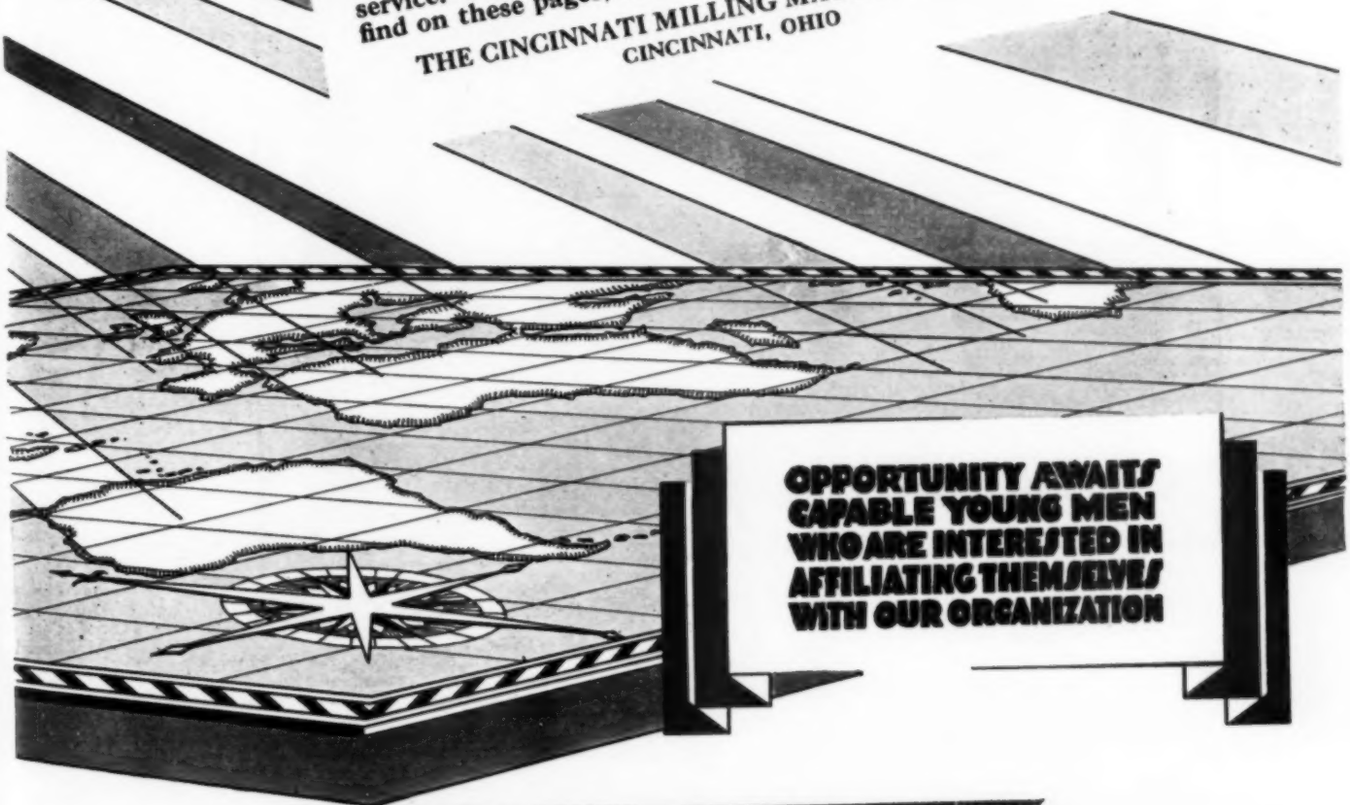
the WORLD

OUR organization is world wide. It consists of our own Specialists and Service Experts and the Technical Salesmen of our agents; most of whom have been affiliated with us for many years.

Enthusiasm for our products and for our organization is characteristic of our entire personnel. With a record of outstanding achievement, and with a determination to maintain a position of Leadership, you, as a prospective user of our equipment, can be assured of service of unusual quality and scope.

Never in the history of our company has there been a heavier demand on us for authoritative advice on milling; never have we been better prepared to give this advice and service. Our agent in your territory, whose name you will find on these pages, is ready to render you this service.

THE CINCINNATI MILLING MACHINE COMPANY
CINCINNATI, OHIO



OPPORTUNITY AWAITS CAPABLE YOUNG MEN WHO ARE INTERESTED IN AFFILIATING THEMSELVES WITH OUR ORGANIZATION

CINCINNATI MILLERS

. . . . AMONG YOUR N

THE CINCINNATI BICKFORD TOOL

NEW YEAR RESOLUTIONS,

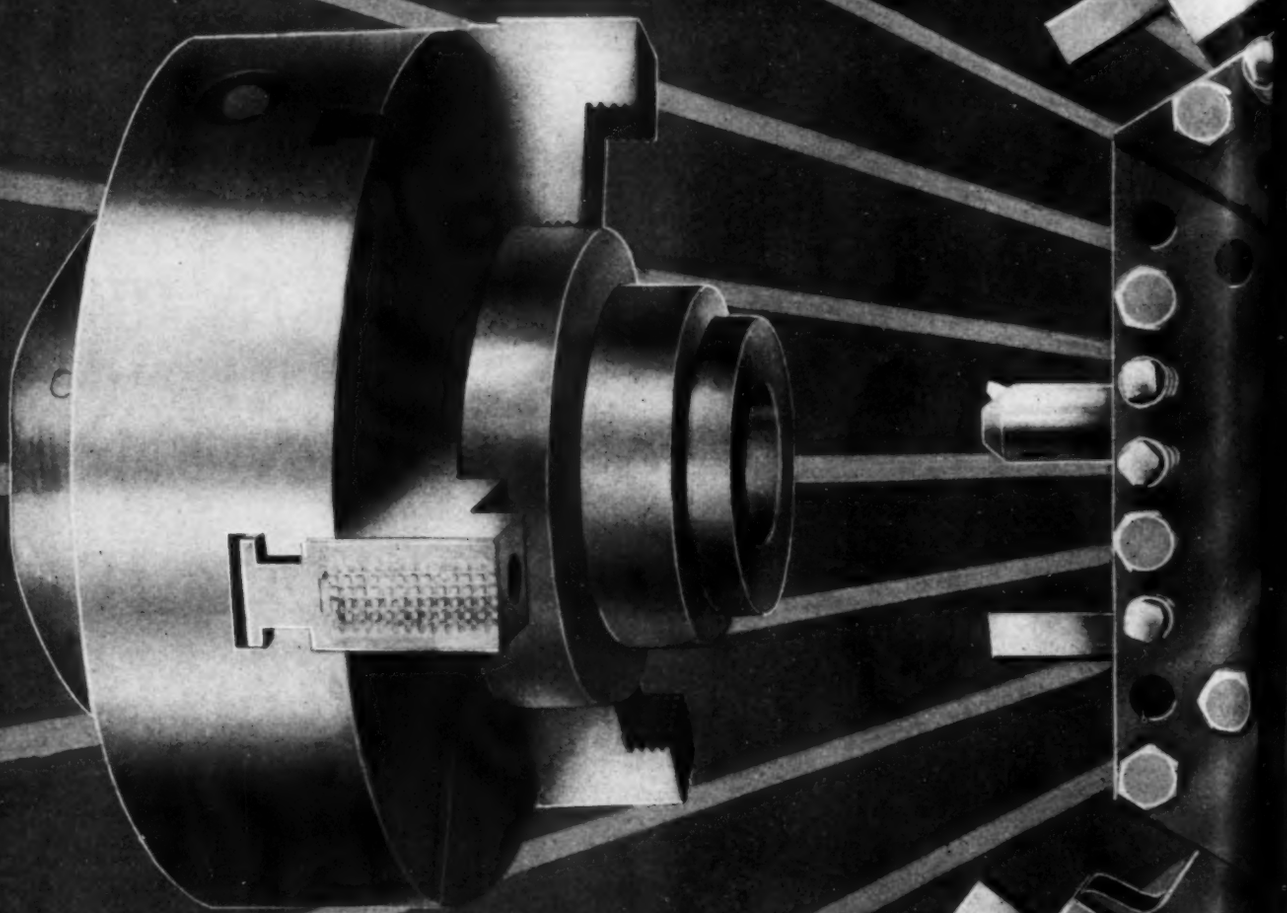
We suggest this one:

Resolved — THAT WE WILL INVESTIGATE THE SAVINGS THAT CAN BE MADE IN OUR DRILLING TIME BY THE USE OF SUPER-SERVICE RADIALS AND CINCINNATI UP-RIGHT DRILLS.

COMPANY, OAKLEY, CINCINNATI, OHIO.

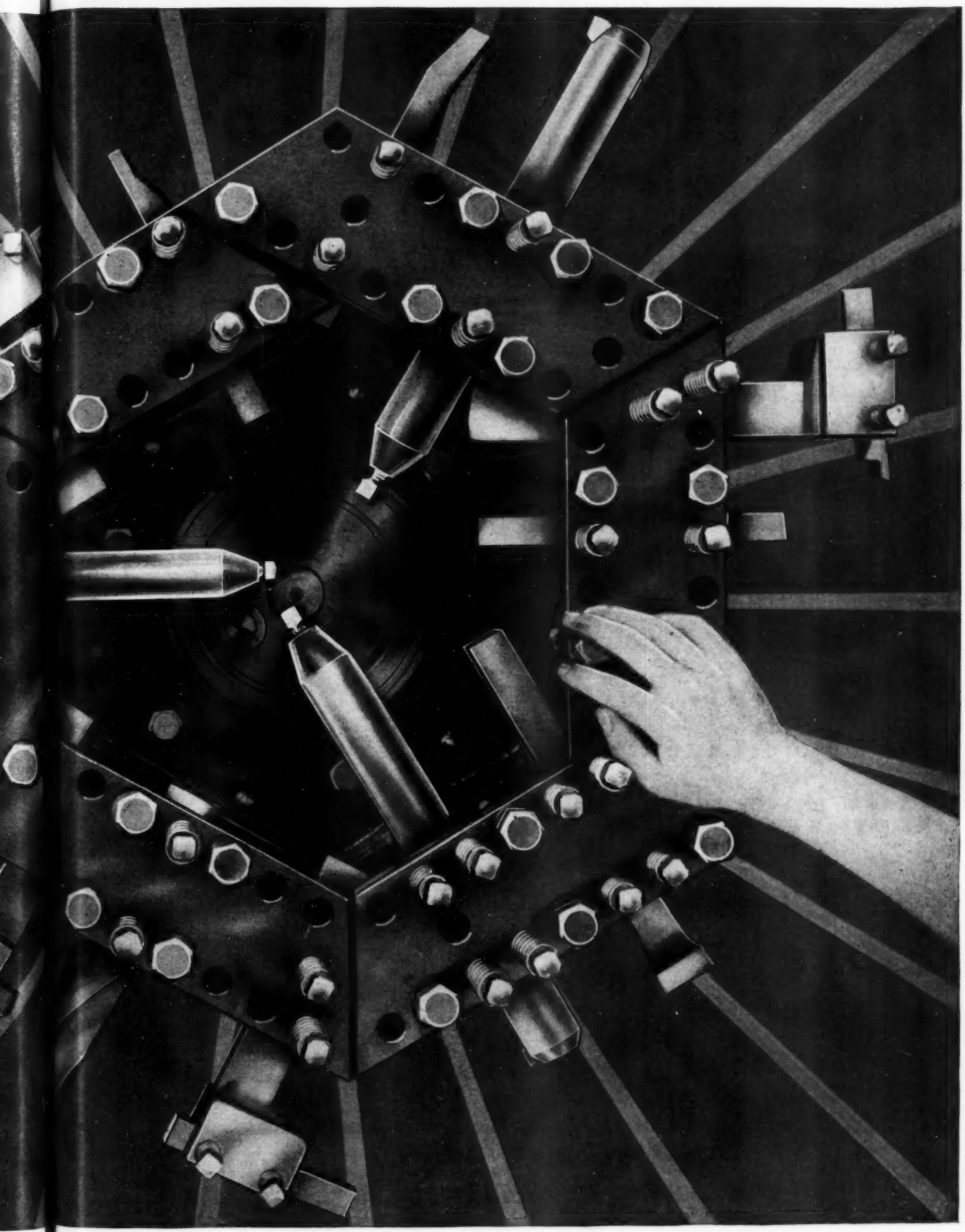
J&L
JONES & LAMSON

A TURRET BRISTLING WITH TOOLS



J&L Standard Tools are so easily and quickly set that multiple tooling is profitable even in small lot production

JONES & LAMSON MACHINE COMPANY
SPRINGFIELD, VERMONT



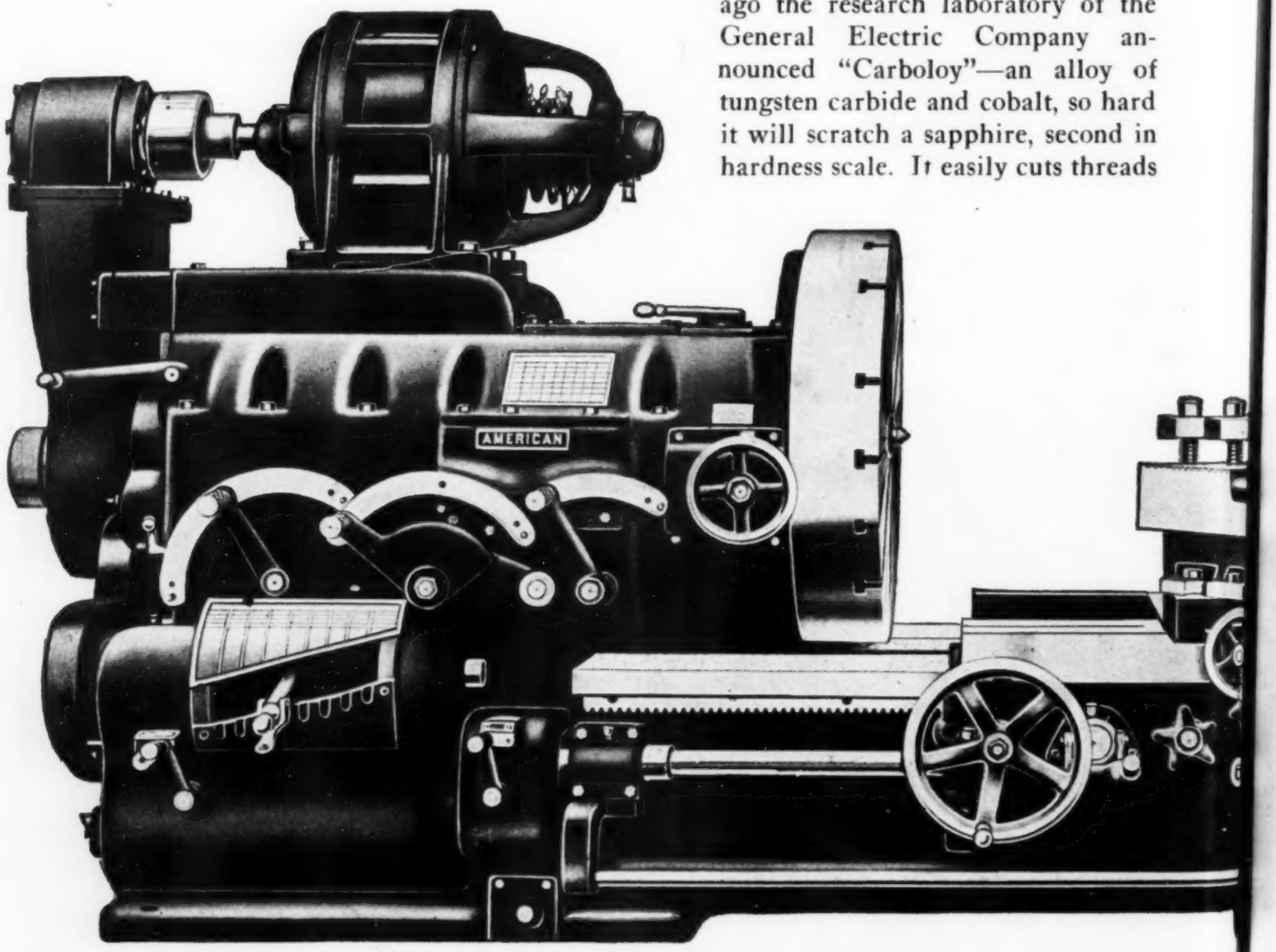
Look to the

"American"
Super Productive
Heavy Pattern Lathe
36" — 42" — 48"

FIVE new inventions a minute—who is there that can afford to sit back and take it easy? Current developments in the electrical, chemical, textile, and steel industries follow upon one another in bewildering procession.

Where once buyers of production equipment could safely purchase tools on past performance, now they must *anticipate* future trends or they will awake some fine day to discover the parade has passed them by.

For instance, just a few short weeks ago the research laboratory of the General Electric Company announced "Carboloy"—an alloy of tungsten carbide and cobalt, so hard it will scratch a sapphire, second in hardness scale. It easily cuts threads



The American Tool Works

future also—

in a glass rod and readily machines porcelain.

Unquestionably such achievements are but the forerunner of others and, like the introduction of high speed steel, will mightily effect machine design.

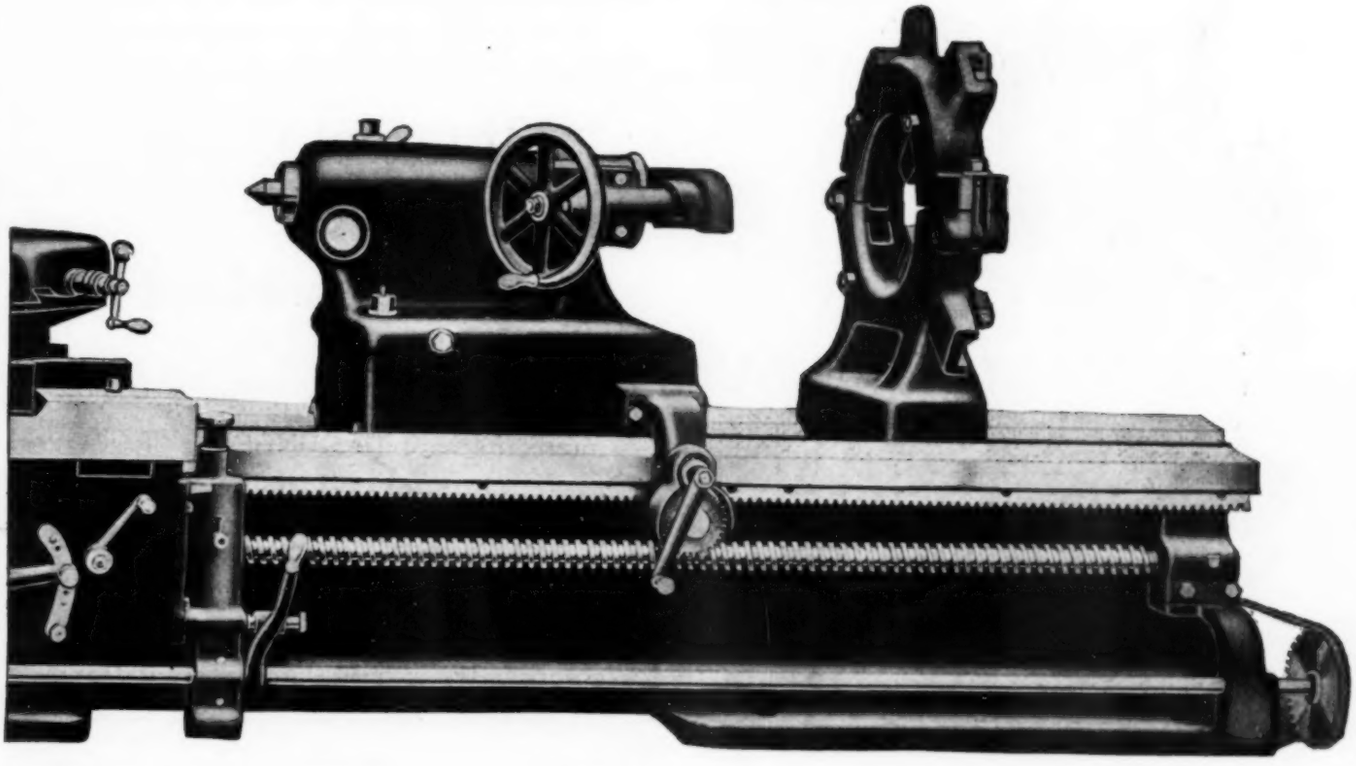
Because "American" designers have always given due thought to the future, such husky producers as the Super-Production Lathe can be safely bought with the complete assurance that the machine will amply support any cut such tools will stand.

The patented 18-speed geared head in which 12 of the 18 speeds are obtained through the internal face plate drive, makes it possible to turn 6 in. dia. stock at 32½ r.p.m.—about three times greater internal gear speed than you have been accustomed to getting on your ordinary geared head lathes.

As for heavy work: There are many railroad and car shops using these lathes to turn car wheels—surely a real test and a good indication of the capabilities of the "Super-Production" Lathe.

There are many striking design features you should know about. Your address brings illustrated bulletin.

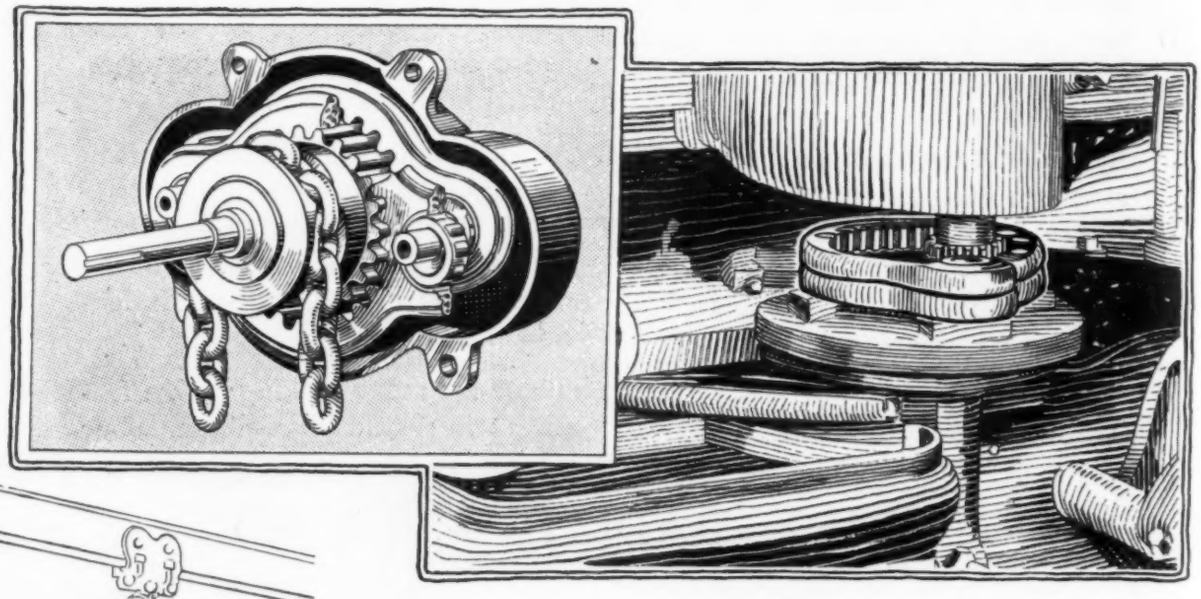
LATHES—RADIALS—SHAPERS

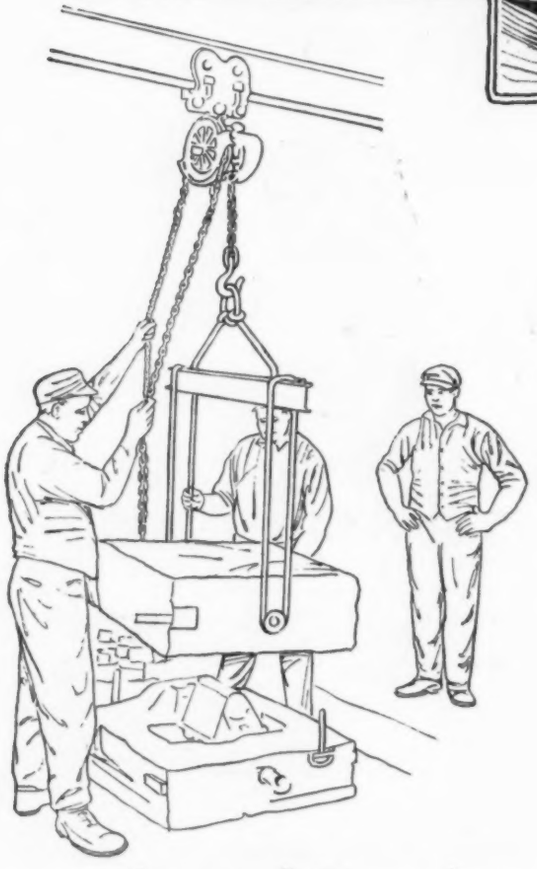


Company, Cincinnati, U. S. A.

Shaping Gears To Industry's Needs

Cutting Gears for





Internal Gears for Chain Hoist

Internal Gears For A Chain Hoist

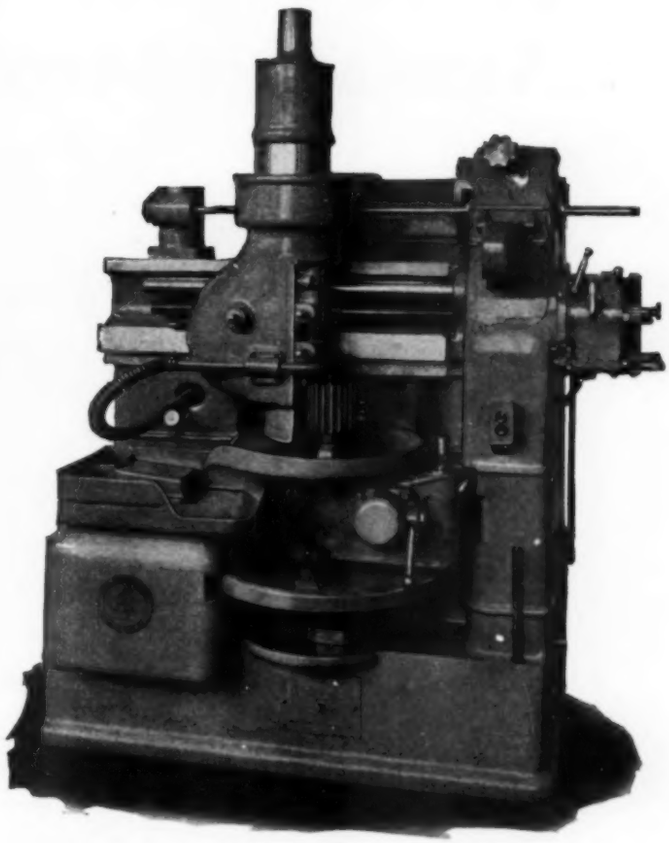
This high-speed chain hoist presents an interesting application of the internal gear. The head of the hoist, in addition to containing the load chain wheels, is also provided with a train of spur gears and an eccentric reduction arrangement composed of external and internal gears. These gears, when in operation, possess a peculiar gyrating movement, which

Hoist Manufacturers

makes high-speed operation possible with practically no vibration. This peculiar arrangement of gearing not only makes a compact hoist design possible, but also affords great lifting capacity in comparatively small space.

The construction is plainly visible in the detail illustration. The external teeth on the lift wheel are surrounded by two internal gear yokes—one behind the other. The internal gear yoke in the foreground is shown engaging the lower side of the lift wheel, and at the same time the rear yoke is engaging the upper side of the lift wheel, thus equalizing the load on the bearings.

Our book "The Practical Art of Generating" illustrates many other interesting examples of profitable gear applications. Send for your copy.



The possibilities of the Gear Shaper process are many and varied. In some cases special cutters are necessary which require seasoned engineering experience. Put your problems up to us for solution.

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Works: **78 River St., Springfield, Vt., U. S. A.**

Branch Office: 1149 Book Bldg., Detroit, Mich.

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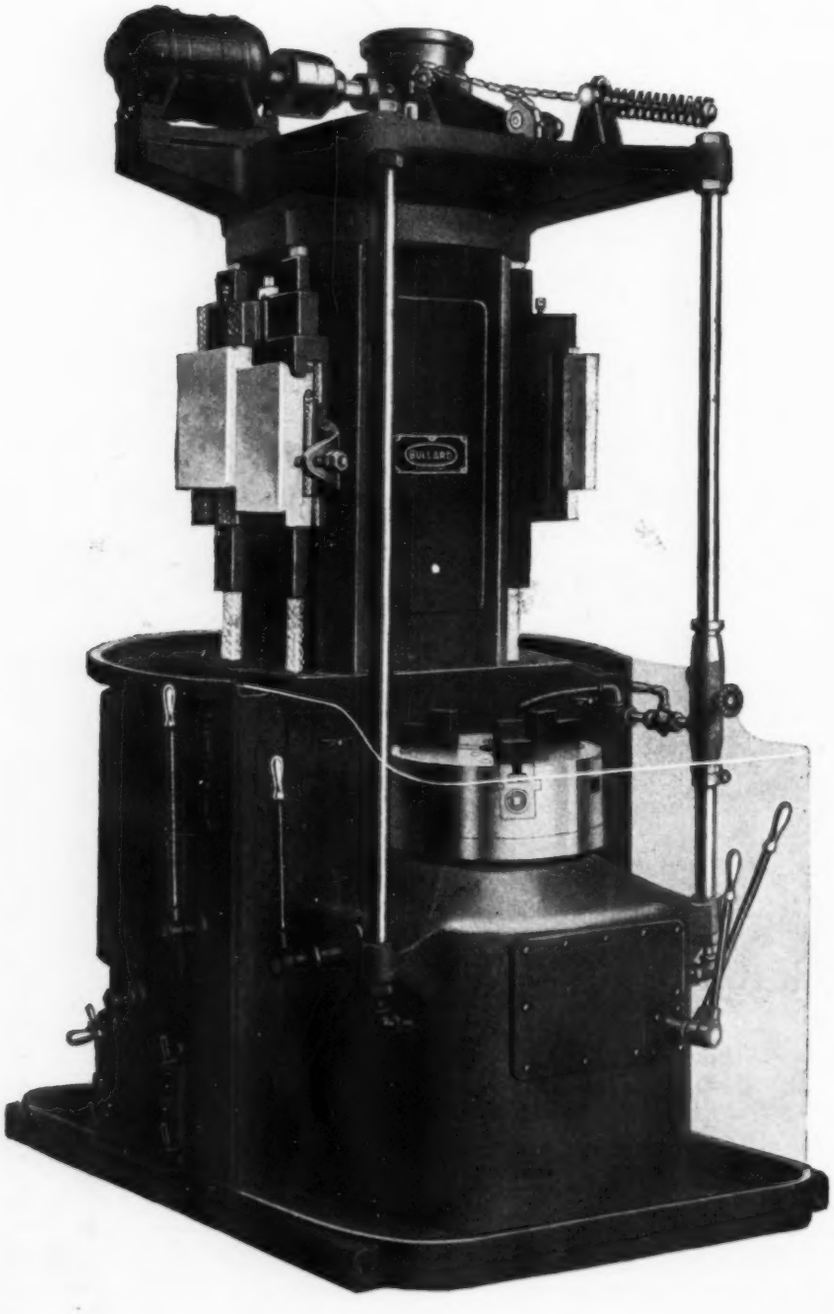
PACIFIC COAST REPRESENTATIVES: C. F. Bulotti Machinery Co., San Francisco for Northern California, Reeves & McBride, Los Angeles, for Southern California.

The Latest Offering

Production with a METHOD—large or small quantities on a Bullard Auto-Matic Vertical Turret Lathe



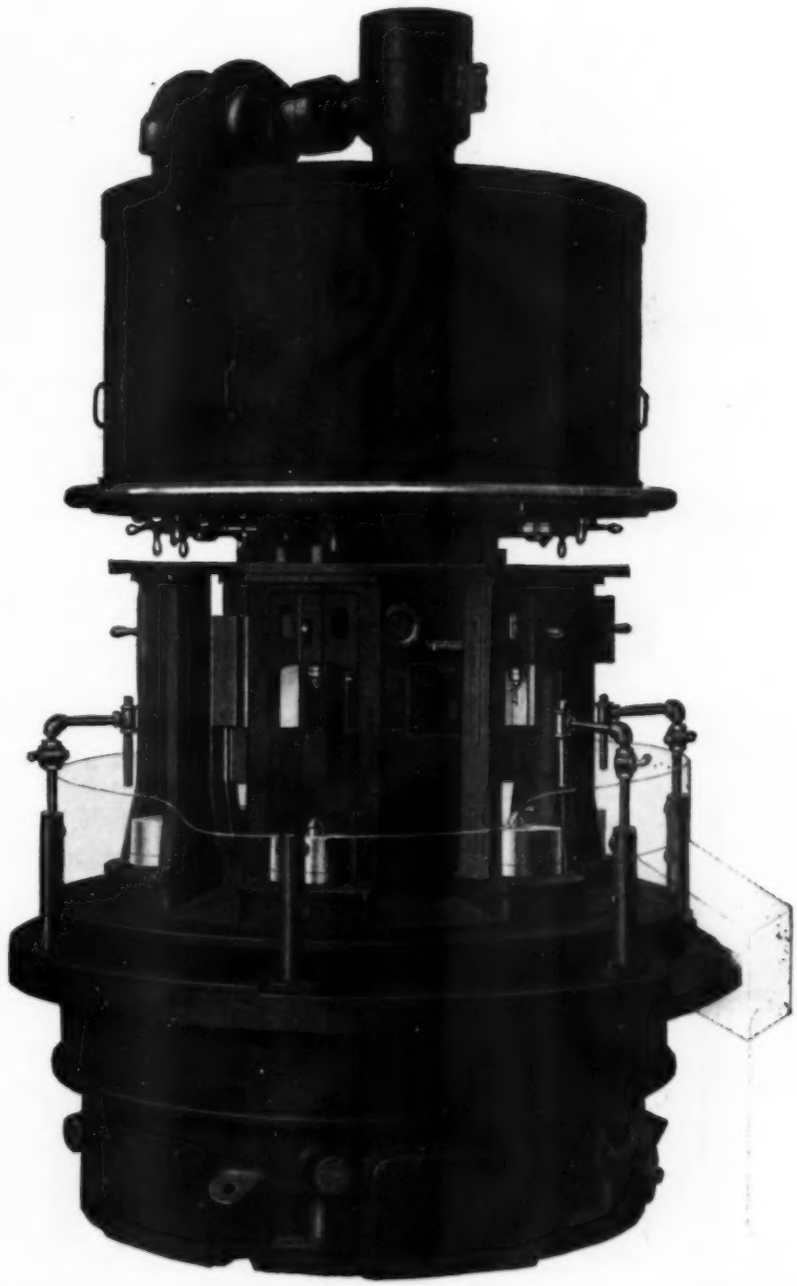
A definite method built into the equipment which makes up your production line gives a unity to the process that means smooth flow of work and lower costs. Progressive manufacturers have learned that the Bullard method is truly Production and Bullard equipment are the "key" units in any production line.

THE BULLARD MA
Bridgeport,

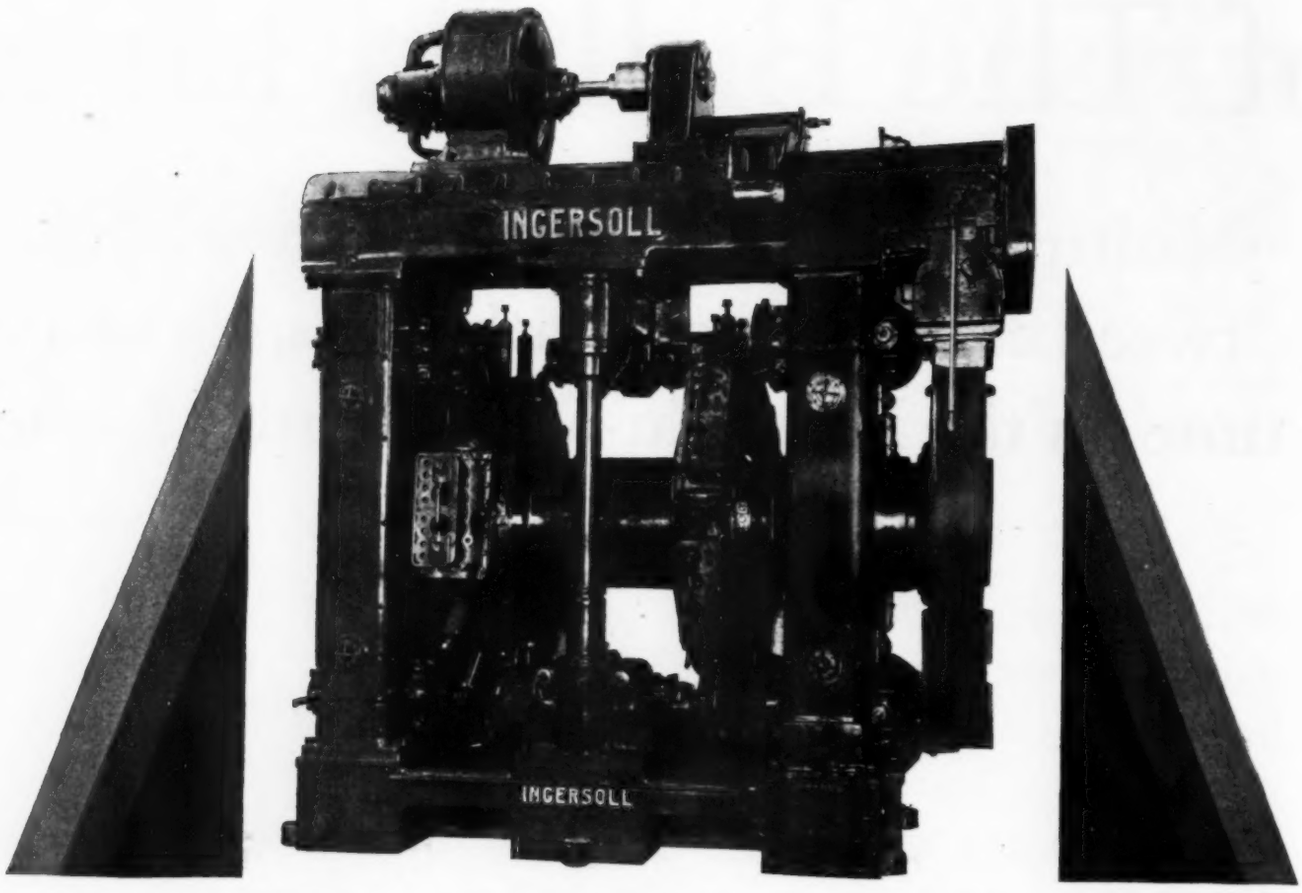
# of The Bullard Line

Multiple Spindle Turning on work between centers—your lathe jobs, six at a time on the Mult-Au-Matic Center Lathe

Performance of six individual machines is handled by one Mult-Au-Matic Center Lathe, with five spindles operating simultaneously at speeds suited to different diameters of the piece — five heads feeding in the proper direction at the correct rate of feed, each for its particular operation—one station loading simultaneously with five in operation.



CHINE TOOL CO.
Connecticut



MILLING CYLINDER BLOCKS
1100 TO 1200 IN 8 HOURS.

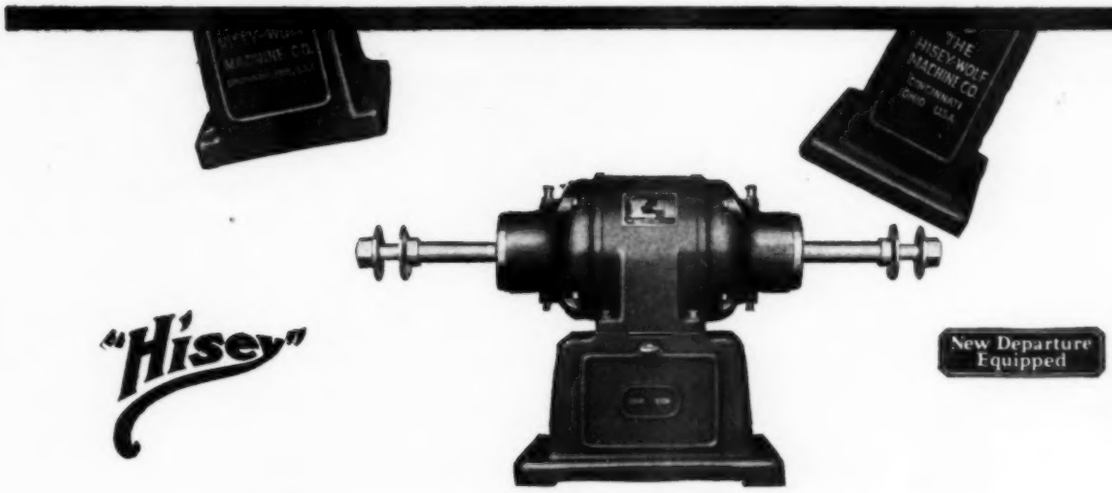
This Ingersoll twelve-spindle Drum Type Continuous Milling Machine mills both sides of cylinder blocks at the rate of from eleven to twelve hundred in eight hours. The fixtures, which hold sixteen castings, revolve continuously past the cutters. Ample time is allowed for loading. Two operators on each side of the machine keep the fixtures loaded with rough castings.

This is one of the many special Ingersoll milling machines which we have built to meet special problems. We also build special boring machines, and multi-spindle drilling and tapping machines for a wide variety of work. Many of these are described and illustrated in our bulletins. Write for copies.

THE INGERSOLL MILLING MACHINE CO.
Rockford, Ill.

Ingersoll

The Way to Smooth, True-Running Spindles



QUICKLY attained speeds; true, free-running spindles, as well as compactness and simplicity of design, were features desired by Hisey in its line of grinders and buffers.

And this is how New Departures did these things for Hisey:

Press the button — and notice how quickly the spindle *leaps* to full speed. Only with ball bearings can you have starting friction as low as running friction.

Note the smooth high speed with which it bites into the piece. The metal-to-metal contact of balls freely rolling in mirror-smooth, accurately ground raceways in New Departures account for the permanently precise positioning of the spindle.

Furthermore, New Departures lend themselves to effective seals for the retention of lubricant and exclusion of abrasive foreign matter.

Help in design and application of ball bearings to your own product or machines is available without obligation.

The New Departure Manufacturing Company, Bristol, Connecticut; Detroit, Chicago and San Francisco. Resident engineering representatives in all industrial centers.

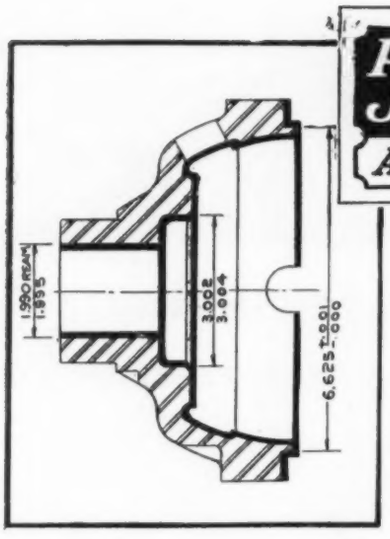
NEW DEPARTURE

BALL BEARINGS

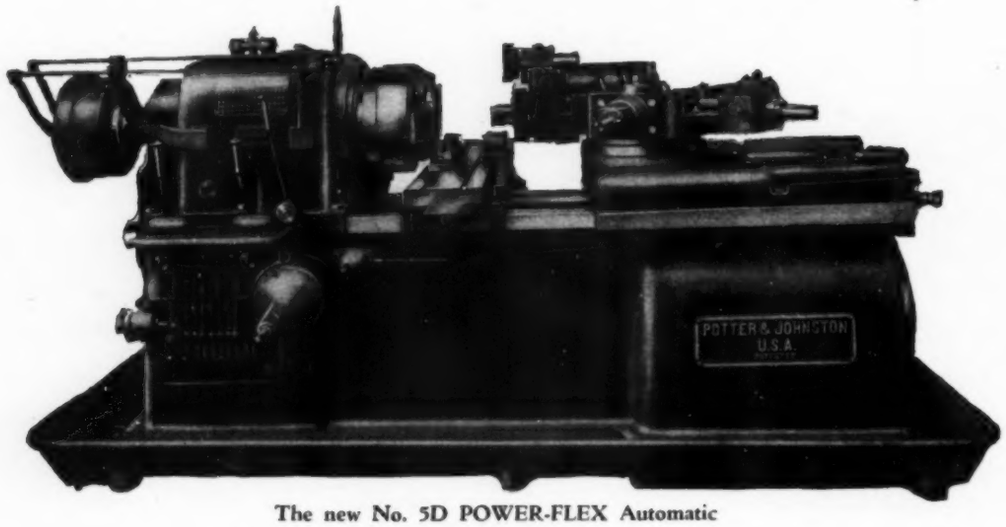
170

ARE YOU

POTTER and JOHNSTON AUTOMATICS



DIFFERENTIAL CASE
MATERIAL S. A. E. 1035
MACHINING TIME 9¾ MIN.



The new No. 5D POWER-FLEX Automatic

TIMKEN
Tapered
ROLLER BEARINGS

BELOW IS AN OUTLINE OF THE CUTS TAKEN ON THE DIFFERENTIAL CASE ILLUSTRATED ABOVE

1st Turret Face

Rough bore hole, rough bore 3″ dia. and face, rough finish inside, rough form 3 1/8″ radius, rough face end, rough form 3 1/16″ radius, rough turn 6 5/8″ dia., rough face to 6 5/8″ dia.

2nd Turret Face

Chamfer 3″ dia., finish face inside, finish form 3 1/16″ radius, finish face end, finish face flange.

3rd Turret Face

Finish bore hole, finish bore 3″ dia. and face, finish face inside, finish form 3 1/8″ radius, finish face to 6 5/8″ dia., finish turn 6 5/8″ dia.

4th Turret Face

Ream 1.995″ dia., ream 3.004″ dia., size turn 6 5/8″ dia.

5th Turret Face

Size bore 3 1/8″ radius.

P&J

MACHINING YOUR DIFFERENTIAL CASES BY THE AUTOMATIC METHOD?

If you are not handling this work by the AUTOMATIC METHOD is it not reasonable to suppose that we can help you. Efficiently tooled Potter & Johnston Automatics on this class of work will mean increased profits to you.

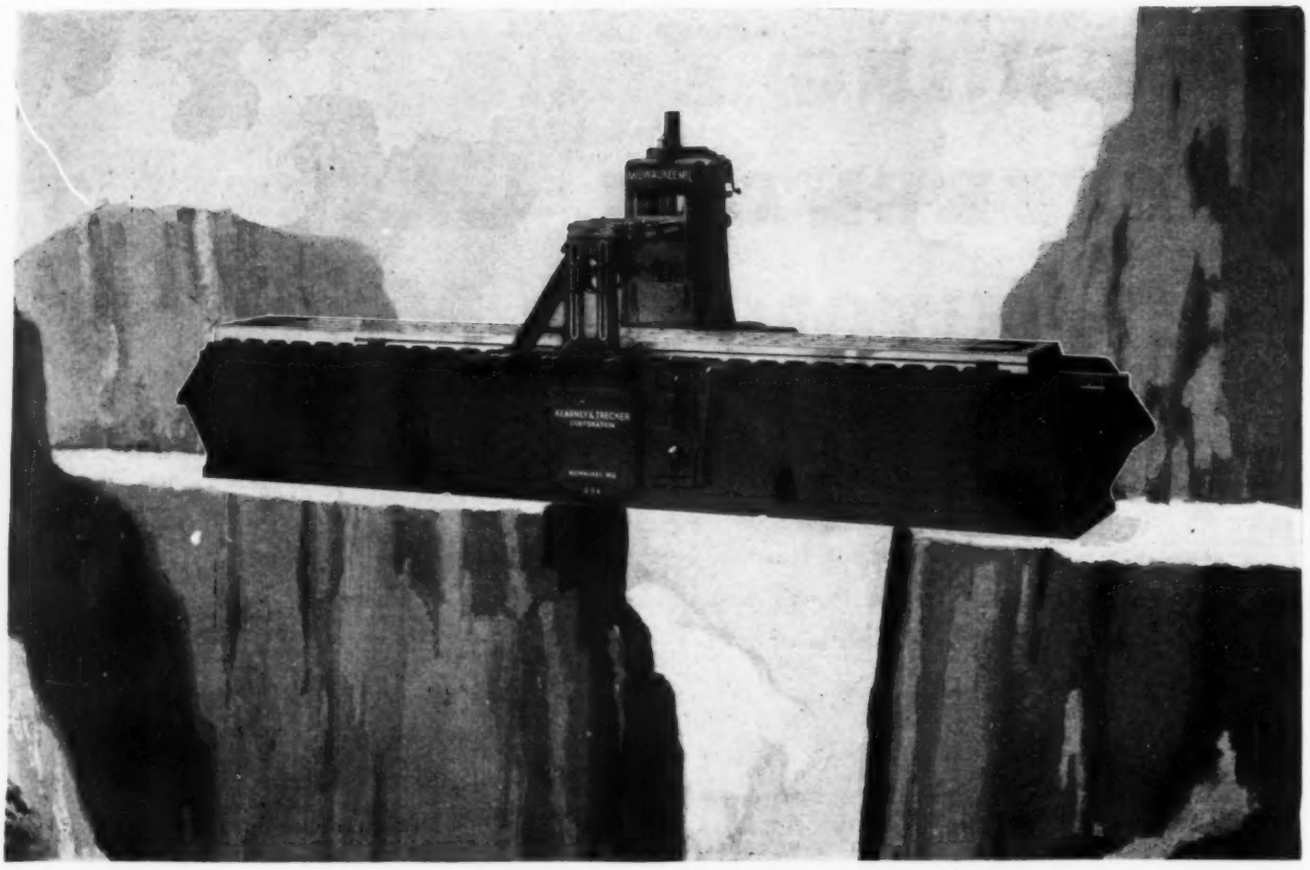
The POWER-FLEX 5D Automatic will, without doubt, handle your Differential Cases at a saving over your present methods. The latest type P & J Automatics are being installed in large quantities in the automotive shops where the most up-to-date machining methods are in vogue due to the keen competition in this line. If you will send us your subject prints and full particulars as to your present methods, our engineers will gladly place figures before you showing the way to new savings.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R. I., U. S. A.

DO IT AUTOMATICALLY!

POTTER & JOHNSTON

AUTOMATICS *for* ACCURATE PRODUCTION



The Mil-waukee-Mil Bridges the Gap!

How about that "open territory" in the milling field? What do you do with those in-between jobs that are too large for a knee type machine — yet hardly warrant investment in a planer type miller?

The new Mil-waukee-Mil is exactly suited for that kind of work. It is small enough to fit into the production line without excessive floor space, yet big enough and powerful enough to stand the gaff month after month without complaining.

The new Mil-waukee-Mil is versatile. It literally blankets the field for all moderate sized milling operations. It gives you the range and rugged power of a planer type mill together with the flexibility of adjustment of a knee type machine.

In addition to filling the gap that now exists between knee and column, and planer type machines, the new Mil-waukee-Mil brings to you another distinct advantage. It is built on the Unit-Plan. This does not mean the old idea of merely bolting on a previously assembled feed box. Nothing like that. *The entire machine* is built up by units.

Furthermore, these are *Optional* units, units that you yourself may select, so that your finished machine embodies exactly the features that your particular job requires. You can select the bed length, the width of table, the feeds, the speeds—yes, even the number of spindles. You purchase just what is necessary for your job—nothing more, nothing less.

There are three basic types of Mil-waukee-Mils — the Simplex, Duplex, and Triplex. Each of these is furnished in two distinct series — the 1400 series, which indicates 14-inch wide tables, and the 2200 series with tables 22 inches wide. All of them have optional power feeds of 2, 3, 4, 5, 7, 9, and 11 feet.

And the beauty of it is that every unit is of standard design—tested and proven — built up and carried in stock.

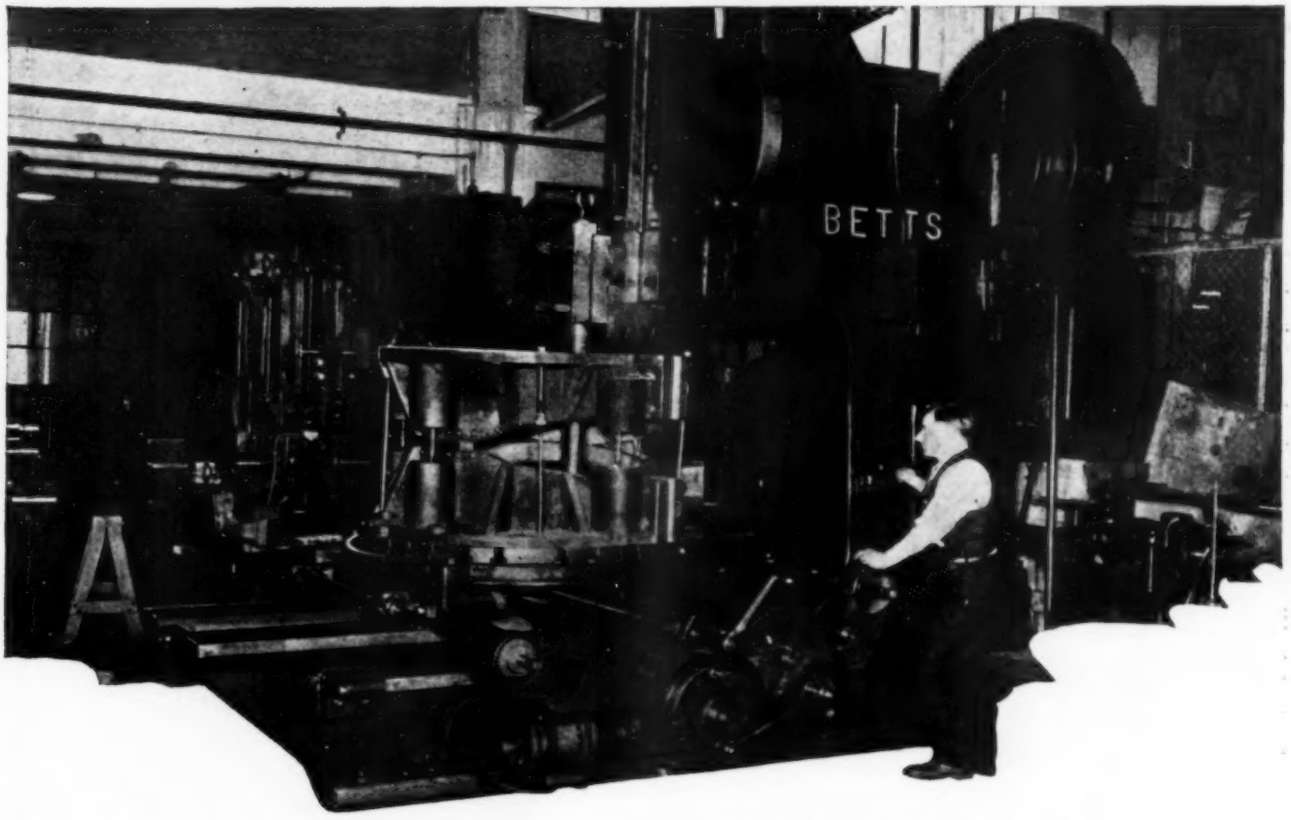
The Mil-waukee-Mil gives you the advantage of this optional unit plan plus all of the refinements of accuracy and workmanship which you may rightfully expect in a modern up-to-the-minute production tool.

We're anxious to demonstrate to you that the new Mil-waukee-Mil not only bridges the gap—but more than that—it's the milling machine of a thousand uses. Don't delay—the earnings from this machine are tremendous.

Patent Rights Fully Reserved

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WIS., U. S. A.

SLOTTERS too, have been modernized
. . . *and all the NEW Features are* HERE!



This modern BETTS OF CONSOLIDATED
has these special Advantages

Centralized Control—with all operating levers on one side of the machine grouped for the convenience of the operator.

Selective Speed Changes are obtained through sliding steel gears, fully enclosed, running in oil.

Power Rapid Traverse to Table by Separate Motor permits operator to instantly traverse table or "inch" it in any direction by operating push button.

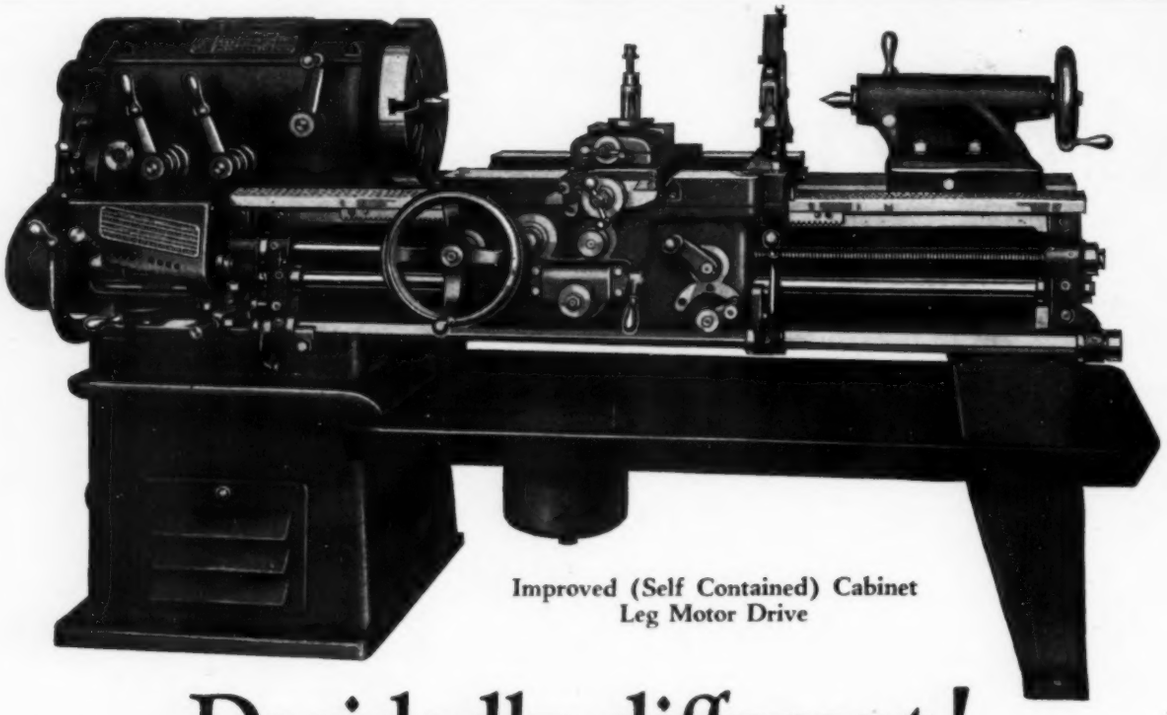
....And lastly and perhaps of greatest importance, *utmost RIGIDITY.*

The balanced proportions of the BETTS, with weight scientifically distributed, will absorb the stresses of heavy duty. The cut is clean and effortless, without laboring or chatter. Every shop man will understand how important this inbuilt rigidity is, especially in a slotter. The biggest shops in the country seem to appreciate this BETTS feature.

BETTS . . COLBURN . . NEWTON . . HILLES & JONES . . MODERN

CONSOLIDATED

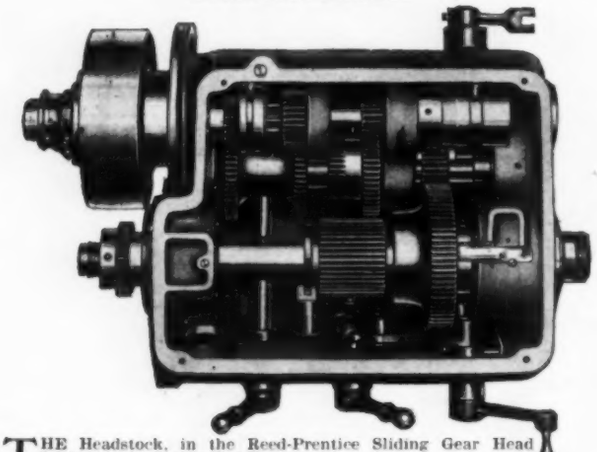
CONSOLIDATED MACHINE TOOL CORPORATION *of* AMERICA, ROCHESTER, N. Y.



Improved (Self Contained) Cabinet
Leg Motor Drive

Decidedly different!

Construction



THE Headstock, in the Reed-Prentice Sliding Gear Head Lathe is an outstanding feature.

A silent, smooth and powerful sliding gear transmission.

With extreme simplicity secured through the use of the least number of working parts—only nine (9) gears for eight (8) spindle speeds.

Gears are nickel chromium S.A.E. No. 3250 electric furnace steel, hardened to Rockwell C-55-58.

Gear teeth are accurately cut and burnished before and lapped after hardening.

Back shafts are heat treated and run in radial ball bearings.

Gears slide on multiple spline shafts of heat treated nickel chromium steel and run in bath of oil.

Main drive pulley provided with disc clutch and brake.

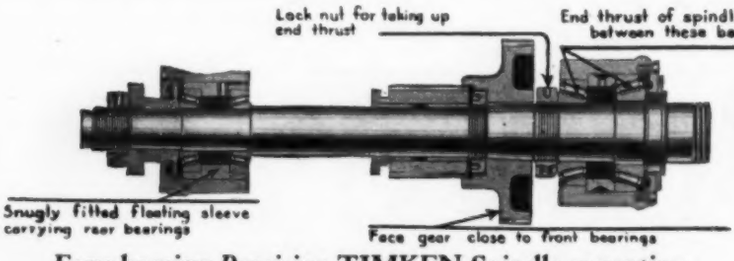
Performance

We here show a 4-in. x 20-in. bar of machinery steel threaded to the spindle nose. No tailstock is used. A cut ⅜ in. deep, with a feed of .112 in. per revolution is taken at a speed of 29 r.p.m.

another difference

The Spindle of S.A.E. No. 3140 heat treated nickel chromium alloy steel running in four bearing Precision TIMKEN mounting, thrust taken on front bearings. Rear bearings are mounted in a snugly fitted floating sleeve to compensate for slight variations in spindle and housing resulting from temperature changes.

All other features in Circular 10-314-16


Lock nut for taking up end thrust
End thrust of spindle taken between these bearings
Snugly fitted floating sleeve carrying rear bearings
Face gear close to front bearings

Four bearing *Precision* TIMKEN Spindle mounting

MACHINE TOOLS

REED-PRENTICE CORP.

WORCESTER MASS., U.S.A.

BRANCH OFFICES:

New York, N. Y.
1508 Evening Post Bldg.

Detroit, Mich.
3-245 General Motors Bldg.

1929

offers greater prosperity to every plant standardizing on

UNION TOOLS

TWIST DRILLS . . . CUTTERS . . .
HOBS . . . REAMERS . . . TAPS . . .
DIES . . . SCREW PLATES . . .
and
SPECIAL TOOLS

UNION
TWIST DRILL CO.

Athol, Mass., U.S.A.

New York Store: 62 Reade St. Chicago Store: 11 So. Clinton St.
Mansfield, Mass. Derby Line, Vermont Rock Island, Quebec

Acme Model C 5 Spindle Automatics

9/16" - 1" - 1 5/8"

More Operations in Less Time and *with Greater Accuracy*

This means faster production of a finer product—in other words, higher quality and lower costs.

Higher quality and lower costs are the factors upon which the growth—the very life even—of the automotive industries depend today, and these factors applied to the little things assure them in the aggregate.

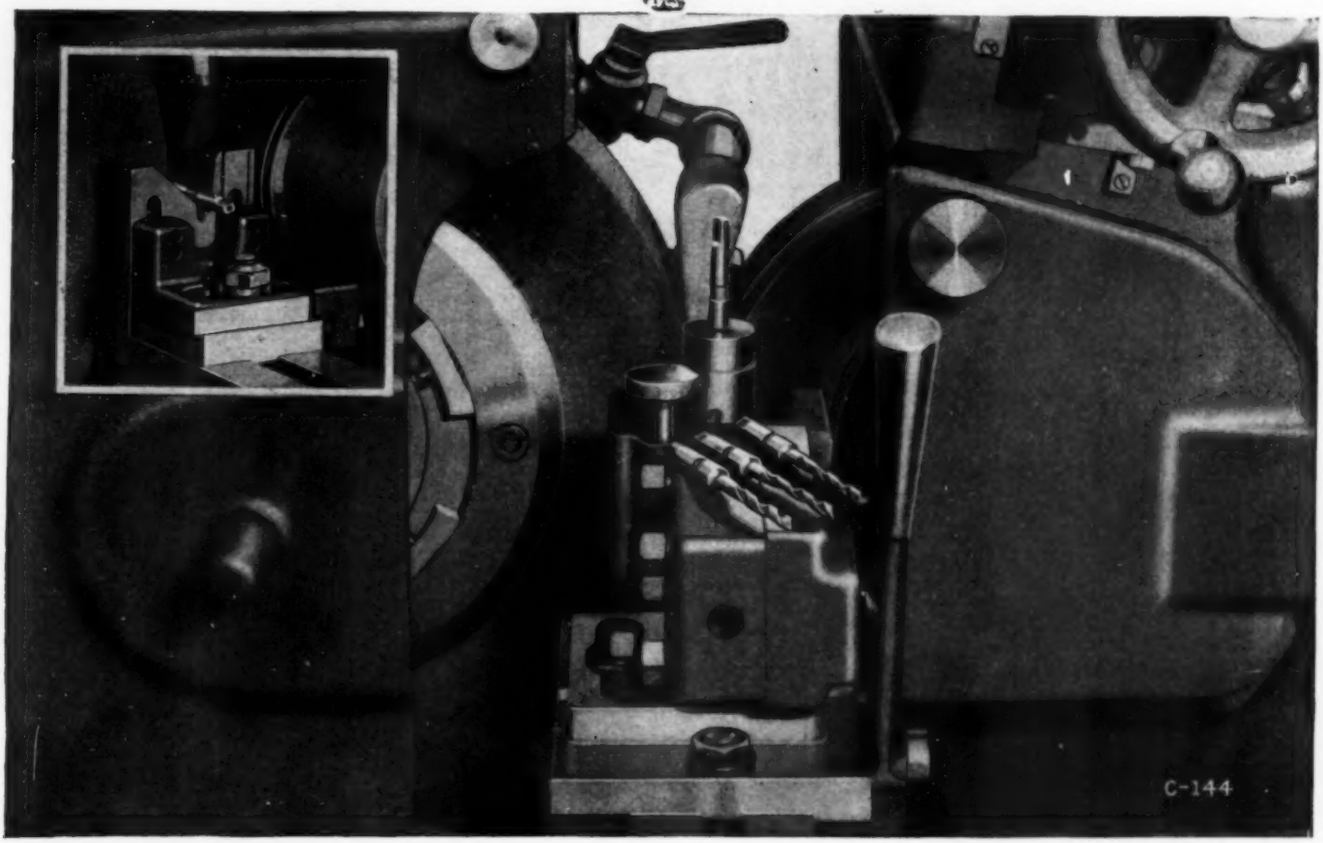
5-Spindle Acmes in the automatic department of an automotive plant assure higher quality and lower costs on the millions of small but vitally important details which originate therein, thereby making a big contribution toward higher quality and lower costs in automobile manufacturing.

The National Acme Company

Cleveland, Ohio—Windsor, Vt.

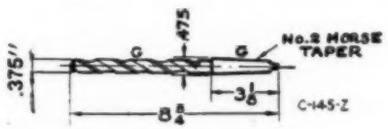
New York, Detroit, Chicago

Makers of Acme and Gridley Multiple Spindle Automatics, Gridley Single Spindle Automatics, and Gridley Multiple Spindle Chucking Machines, at Windsor, Vermont, and Namco Opening Dies, Collapsing Taps, Screw Machine Products and "Positive" Oil Separators and Clarifiers at Cleveland, Ohio



Patented

GRINDING TAPER SHANK DRILLS CONCENTRIC



Part Name—Taper Shank Drills.
Stock Removal—.015".
Number of Cuts—4.
Production per Hour—100.
Grinding Wheels—
Shank—60-J-31-Aloxite.
Flutes—80-L-29-Aloxite.
Wheel Maker—Carborundum Co.
Limits—
Round within—.0002".
Size within—.0005".
Concentricity within .0015" to .002".
Machine—Cincinnati No. 2 Centerless Grinder.

Taper shank drills are ground concentric on Cincinnati No. 2 Centerless Grinders.

For the best production, two machines are used for maintaining the set-ups; one for grinding the fluted barrels and the second for the tapered shanks; which require a tapered regulating wheel. A rough cut is first taken on the fluted barrels with the tapered shanks rotating in the Vee block as shown in the insert. The rough and finish cuts are next taken on the tapered shanks; for this operation the barrels are inserted in the holder as illustrated, where they rotate freely. The shanks rotate in the Vee block during the finishing cuts on the barrels. The spindle reciprocators (also called oscillators) are used during all cuts.

By this method the drills are ground concentric and in line even though eccentric and slightly crooked before grinding.

"A New Service With New Methods of Grinding"

CINCINNATI GRINDERS INCORPORATED
CINCINNATI, OHIO

CINCINNATI GRINDERS

Are you trying to meet competition with has-been equipment?

Jan 17th

The Semi-Annual
SHOP
EQUIPMENT
REVIEW
and
CATALOG
NUMBER

TRYING to get modern production out of equipment that simply can't meet the demands is absolutely useless.

Most equipment-minded executives in the metal working fields have for years realized the necessity for supplanting the old with the new as soon as it has demonstrated definite superiorities. Yet many plants handicapped by antiquated equipment are still fighting on unsuccessfully against competition.

Take inventory of your own shop . . . how does it size up with the most modern types of machines and methods?

For years the majority of the keymen in the metal working industries have used the Semi-Annual SHOP EQUIPMENT Review and Catalog Number for just such comparisons, and to find the right machine to fill the job.

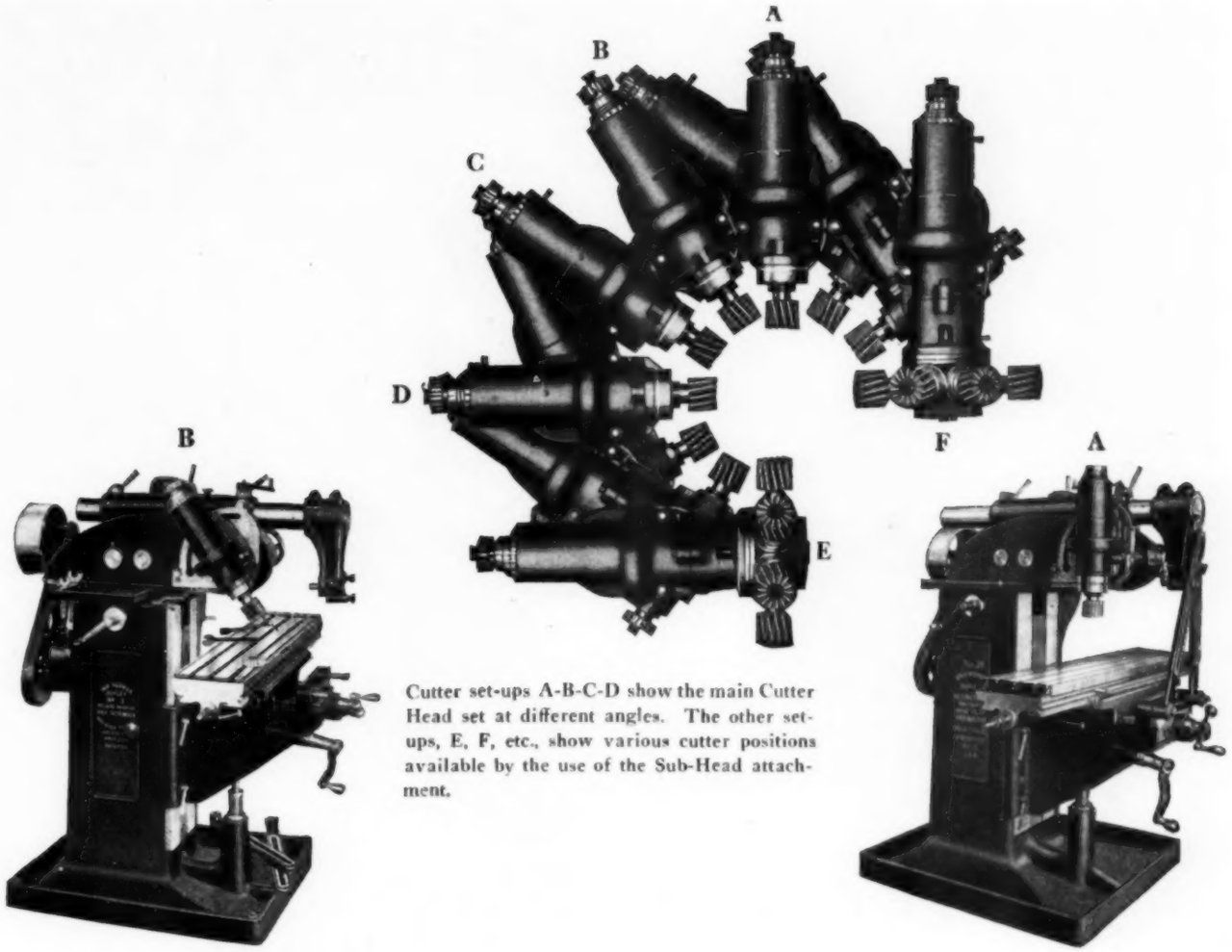
Another issue will be out soon. It will be a complete condensed catalog of all the worthwhile improvements made in the past six months. More than 400 items will be illustrated and described in short, concise terms . . . really an Encyclopedia of Mechanical Development.

Keep this issue handy . . . it will be out Jan. 17th.

American Machinist

A.B.C.
A.B.P.

A McGraw-Hill Publication
Tenth Avenue at 36th Street, New York, N. Y.



Cutter set-ups A-B-C-D show the main Cutter Head set at different angles. The other set-ups, E, F, etc., show various cutter positions available by the use of the Sub-Head attachment.

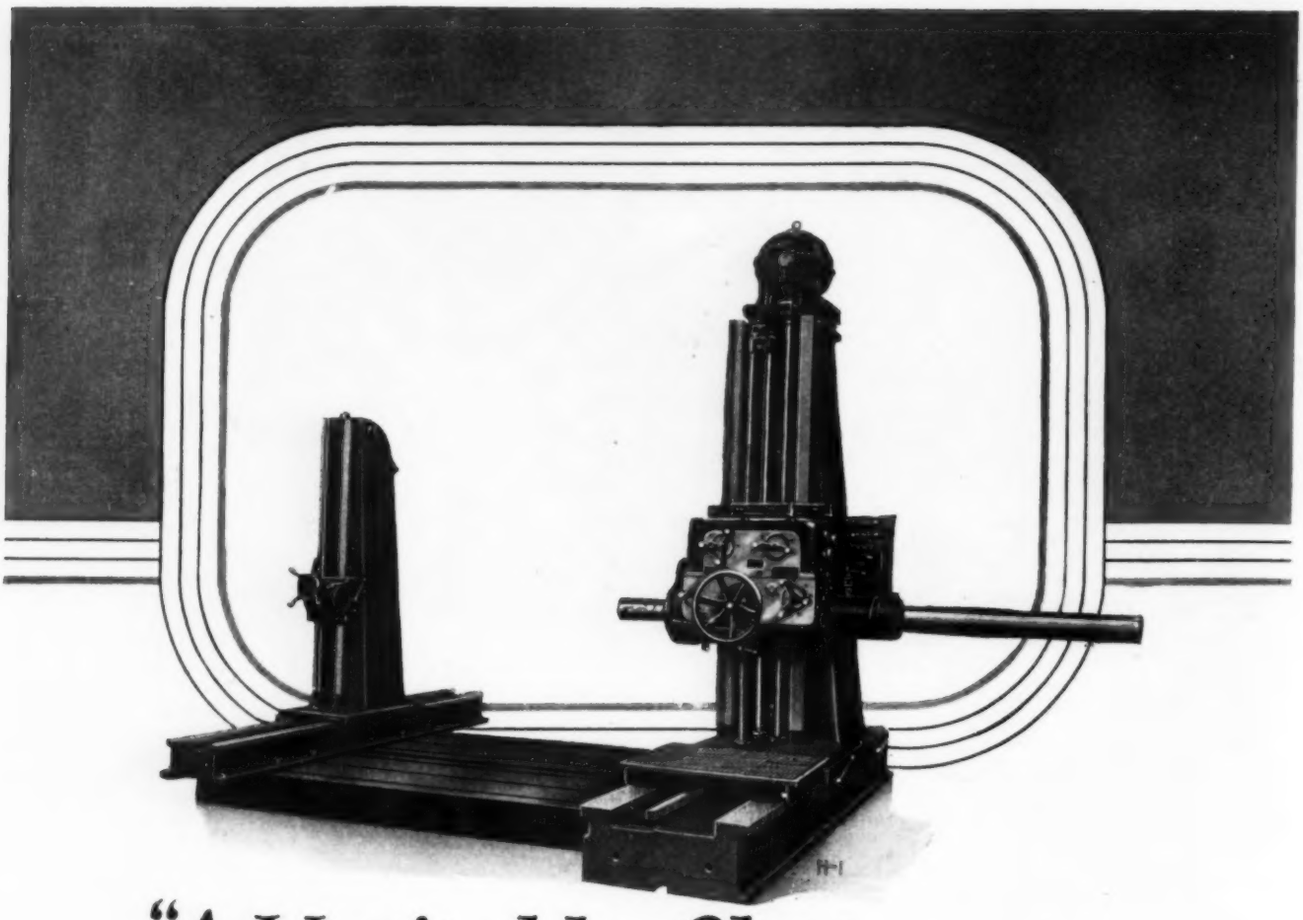
WITH its Cutter Head pivotally mounted on a horizontally slidable Ram, the Van Norman "DUPLEX" offers the most completely universal milling machine obtainable for general utility and toolroom purposes.

It's unusual range and ability to handle all phases of milling—*frequently at one setting of the work*—is saving substantial sums for most of the leading shops in this country.

What they are doing for others—they will do for you.

Van Norman Machine Tool Company
160-200 Wilbraham Street, Springfield, Mass., U. S. A.

Van Norman "DUPLEX"



"A Veritable Shop in Itself —

The Landis Boring, Milling and Drilling Machine besides having a high record for smooth power and accuracy becomes, with its accessories, many machines in one.

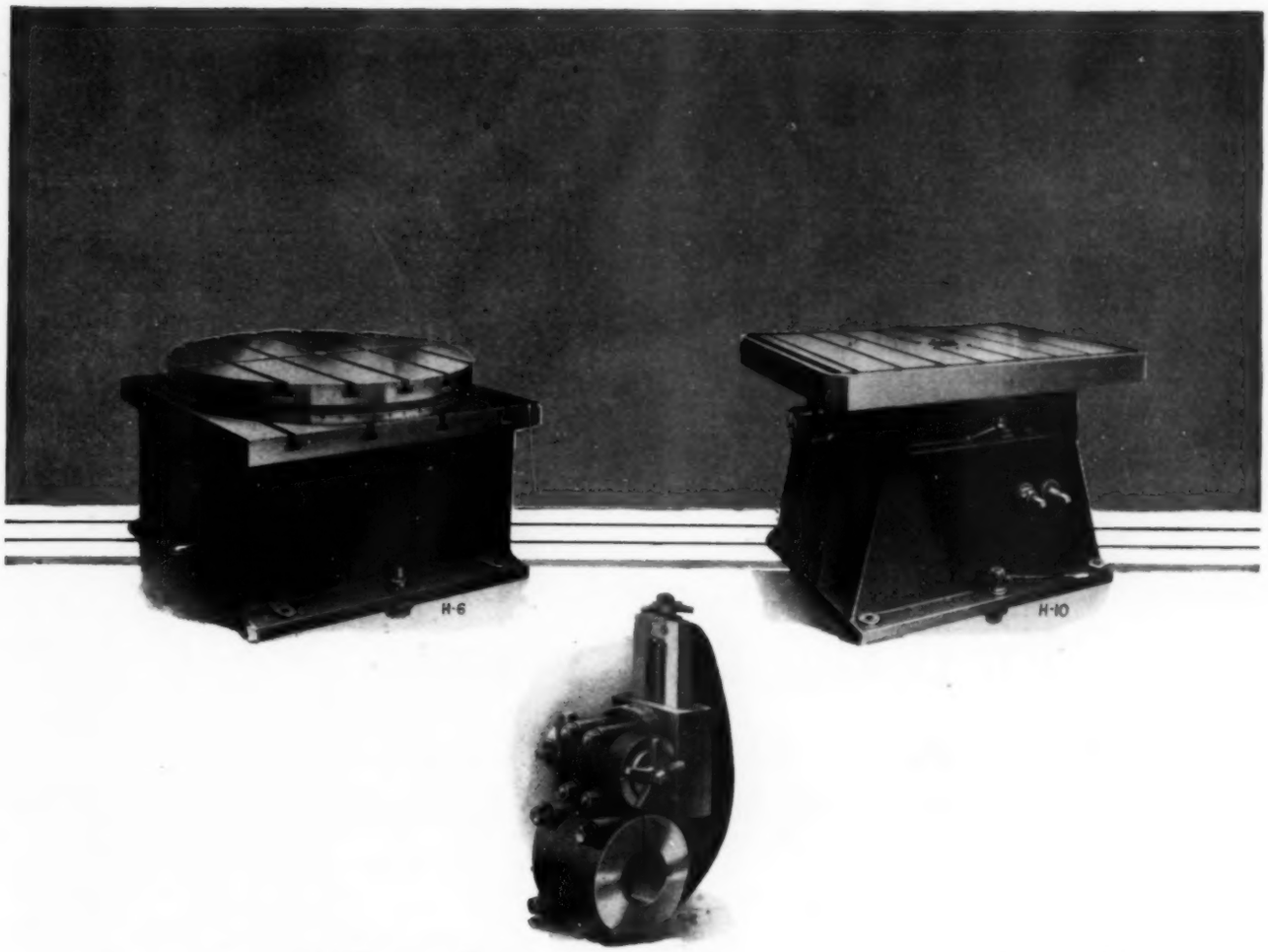
The universal table eliminates set-up time as five sides of the work can be finish bored, tapped, drilled and milled at a single set-up. In addition to the rotary movement of 360° it has a tilting movement of 90°.

Facing heads are invaluable when facing operations are required. They are designed to be clamped to the spindle or attached to the face plate and may be had in either the plain or swiveling type.

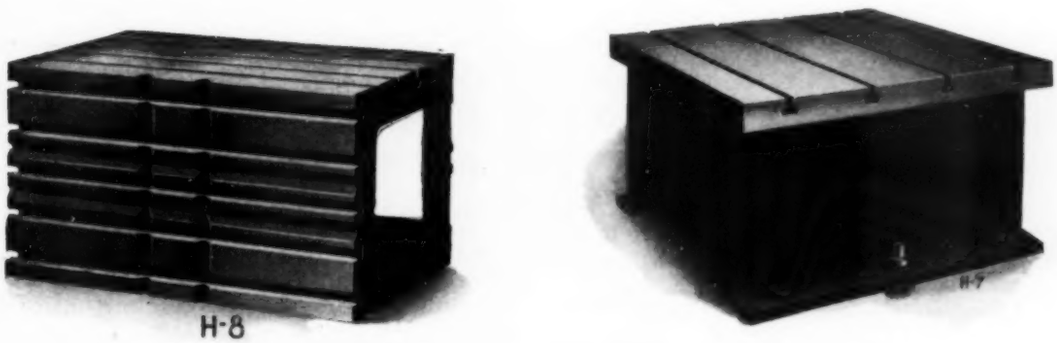
There are also the plain square tables, the square tables with revolving tops and the square block tables. All are available in several popular sizes.

Flexibility, ruggedness and accuracy are built into each and every one of these attachments. The extent of their usefulness is amazing. Why not ask for a copy of catalogue #X-28 which tells the story in greater detail than these two pages.

Detroit Chicago



— with these Accessories"



LANDIS TOOL COMPANY

Waynesboro, Pa. U.S.A.

New York — Philadelphia

Find the guilty machines!

Do not let this December Session pass without trying each of your old machine tools

A year is almost gone. Since last January some of your old machine tools have definitely gone over into the "obsolete" column and are stealing your profits. Others have been doing it for years.

Let this be the last year of these unseen insidious losses that put a burden on your selling force as well as production.

Make up a history card of each major machine tool. Find out what modern improvements have been made, what new machine could do its work at a great saving in cost.

Try each machine separately. Find out if you could increase your profits by scrapping your obsolete tools and installing modern machines.

We will cooperate with you to the fullest extent. The men in our various Divisions will help you to prove whether or not new machinery should replace some of your present equipment. We will tell you honestly if ours or some other manufacturer's machine tools are best for you.

Send us a list of your "doubtful" tools with details of the kind and quantities of work.

Niles-Bement-Pond Company, 111 Broadway, New York

Divisions of NILES-BEMENT-POND COMPANY

THE NILES TOOL WORKS COMPANY, *Hamilton, Ohio* NILES GEAR COMPANY, *Hamilton, Ohio* PRATT AND WHITNEY COMPANY, *Hartford, Conn.*
NILES CRANE CORPORATION, *Philadelphia, Pa.* THE PRATT & WHITNEY AIRCRAFT CO., *Hartford, Conn.*

You might as well burn up your oil as waste it~

We will be in Booth No. 44 at the Chicago Power Show.

An oil field fire—waste!

This wheel-tank for dispensing oils wherever needed—no waste!

You are burning up good money when you waste oil—when you let it leak away or evaporate, or dribble away from leaky faucets.

There is one way to safeguard your oils—only one way, too. Put them in proper tanks, with self-measuring pumps attached.

Inventory your oil in with "Xacto" Meters. Check it out with Bowser self-measuring pumps. Know your inventory at all times—and know too that your oil is used for lubricating machinery and does not become a fire hazard, through "sloppage," wastage and leakage.

Bowser storage and dispensing systems are SAFE—both as to the cash value of the oils, and as to the fire risk. Investigate!

Battery of oil storage tanks with self-measuring pumps attached. No waste!

S. F. BOWSER & COMPANY, INC.

Dependable Pumps and Tanks

1301 Creighton Avenue

FORT WAYNE, INDIANA, U. S. A.

BOWSER

S. F. BOWSER & CO., INC.
1301 Creighton Avenue, Fort Wayne, Indiana

Yes, I'm willing to stop wasting oil. And I sure want to avert fire hazards. Tell me how.

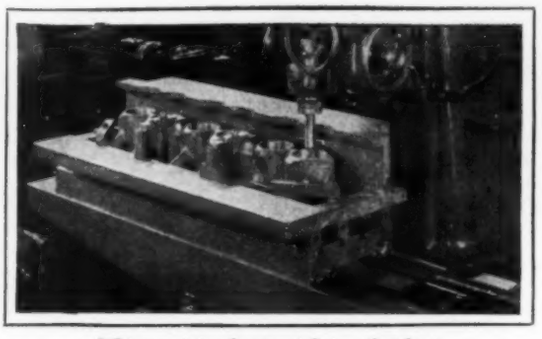
Name .....

Firm .....

Address .....

"I Wish I *had* bought a P & W JIG BORER"

It took the loss of five good customers to make this man realize that in precision boring he could not compete on even terms with a rival who owned a P & W Jig Borer. Are you worried about competition that only a Jig Borer can fight?



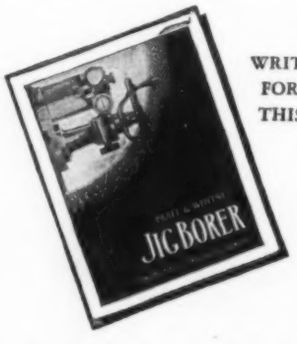
This precision boring job is 5 feet long

WHILE the Pratt & Whitney Jig Borer is a real money saver in the tool room or machine shop of any plant that can use it, it becomes a vital essential where precision boring is done on a competitive price or quality basis.

Here is a machine that locates, bores and checks its own work to ten thousandths of an inch. All this it does by methods so fundamentally simple and sound that it is hard to conceive of any radical improvement.

Don't let the lines of worry crease your face because of your precision boring equipment.

Let us send a man to you who will explain clearly why the Jig Borer is a working investment that begins to pay for itself with the first turn of the spindle and does not stop earning when the entire cost has been wiped out over and over again. Write to our nearest sales office for a man.



WRITE FOR THIS

PRATT & WHITNEY CO., *Hartford, Conn.*

Division NILES-BEMENT-POND COMPANY

"One year ago I bought a P & W JIG BORER"

There are more than 300 such men in the United States—men for whom the P & W Jig Borer is cashing in every day, and inducing the contented and permanent smiles to their faces.

Three P & W Jig Borers in a well-known Detroit Tool Shop. Each has proved its earning power on an infinite variety of jobs.

IN almost every branch of the metal working industry, P & W Jig Borers go about the nice business of precision boring with a direct simplicity that brings quality into the work and profits to the books.

We do not know of a single dissatisfied user and many of our customers have bought second and third Jig Borers after the first had proved its worth many times over.

No matter what kind or how much precision boring you do it would pay you to find out if the machine that locates, bores and checks to ten thousandths should be in your shop.

Tell us the kind of work you do and the quantities; or better still, permit us to send a boring expert who will gladly discuss your work and the adaptability of the P & W Jig Borer on a profit-making or money-saving basis.

In the meantime, write for the descriptive circulars.

Inquire at any of these Sales Offices:

BIRMINGHAM	LOS ANGELES
BOSTON	NEW YORK
CHICAGO	PHILADELPHIA
CINCINNATI	PITTSBURGH
CLEVELAND	ROCHESTER
DETROIT	SAN FRANCISCO
ST. LOUIS	

PRATT & WHITNEY CO., *Hartford, Conn.*

Division NILES-BEMENT-POND COMPANY

TIMKEN *Tapered Roller* BEARINGS

The Cleveland Planer Company, Cleveland, Ohio, equip their Open Side Planers with Dodge-Timken mountings on countershafts and on high-speed drive shafts.

AS more and more machine tool *builders* standardize on Timken Bearings, production costs for machine tool *users* go steadily down.

Knowing Timken economies, it is not essential to know just *how* Timken Bearings accomplish these results.

But the technical reasons are interesting. They are found in Timken tapered construction, full radial-thrust capacity, extra load carrying area, Timken *POSITIVELY ALIGNED ROLLS* and Timken electric steel. The point to remember when considering new equipment is, that Timken Bearings *alone* combine these features.

THE TIMKEN ROLLER BEARING CO., CANTON, O.

"HANSON PROCESS" TAPS are available in *special sizes*, too!

HANSON-WHITNEY'S broad conception of service includes the making of special taps to your specifications or designs.

These "specials" bear the same high standards of workmanship—*accurate in thread form and correct in lead within .0001" per inch.*

Merely give us the facts—kind of thread form, pitch, outside diameter and tolerance limits required. Also state kind of material, indicating whether tap is for blind holes or to be withdrawn, or can be removed after passing through the work. Indicate if provision has been made for proper lubrication.

These facts will enable us to deliver a tool supremely well-fitted to handle your particular work. Prices cheerfully quoted.

"HANSON H PROCESS"

Domestic Representatives: New York, N. Y., L. C. Biglow & Co., Inc.; Syracuse, N. Y., George McPherson; Philadelphia, Pa., D. J. Normoyle; Pittsburgh, Pa., William K. Stamets; Cleveland, Ohio, William K. Stamets; Cincinnati, Ohio, Seifreat-Elstad Mchy. Co.; Dayton, Ohio, Seifreat-Elstad Mchy. Co.; Detroit, Mich., A. G. Brice; San Francisco, Calif., A. H. Coates Co.; Chicago, Ill., E. H. Huntington; Toronto, Montreal & Vancouver, Canada, Arthur Jackson Machine Tool Co.

Foreign Representatives: London, England, Leo. C. Steinle; Rotterdam, Holland, R. S. Stokvis & Zonen, Ltd.; Stockholm, Sweden, Rylander & Asplund, Maskinforsaljning A-B; Paris, France, Fenwick Freres & Co.; Turin, Italy, Fenwick Freres & Co.; Brussels, Belgium, Fenwick Freres & Co.; Barcelona, Spain, Fenwick Freres & Co.; Rio de Janeiro, Brazil, Fenwick Freres & Co.; Zurich, Switzerland, Fenwick Freres & Co.; Tokyo, Japan, Andrews & George Co.; Sydney, Australia, H. P. Gregory & Co., Ltd.

The Hanson-Whitney Machine Company

Hartford, Conn., U.S.A.

Lapping—

Now a real production operation

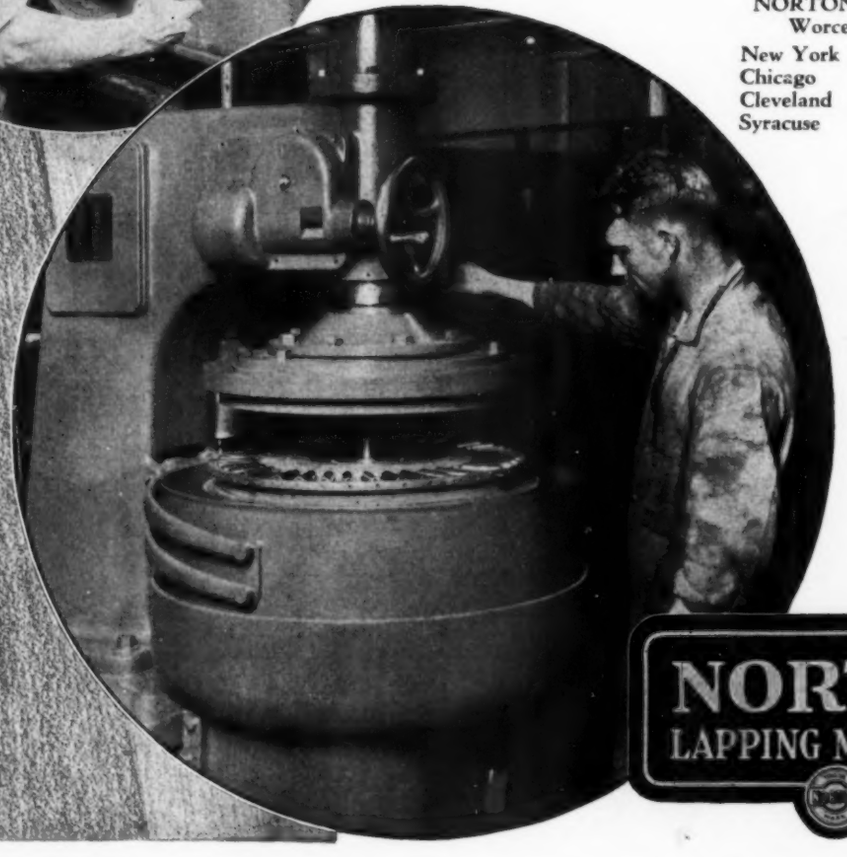
Slow, laborious hand methods have given way to machine lapping.

Lapping has long been considered the ideal way of finishing many kinds of work—but slow, hand methods have made it very costly.

It has now become a real production machining operation.

Norton Lapping Machines lap a score or two of pieces in one load in less time than is required for one piece by hand methods. And the machine lapped pieces are more uniform in both size and finish.

There are Norton machines of various types for lapping flat work, cylindrical work and crankshafts.



NORTON COMPANY
Worcester, Mass.

New York	Detroit
Chicago	Philadelphia
Cleveland	Hartford
Syracuse	Pittsburgh

L-8

NORTON
LAPPING MACHINES

For Broadcut Grinding—

The 14" Heavy Duty BA Grinding Machine

In this new machine is found the proper application of POWER and distribution of WEIGHT to permit rates of feed with wheels 12 in. or 15 in. wide usually possible only with wheels a fraction of these widths.

Other features include:—

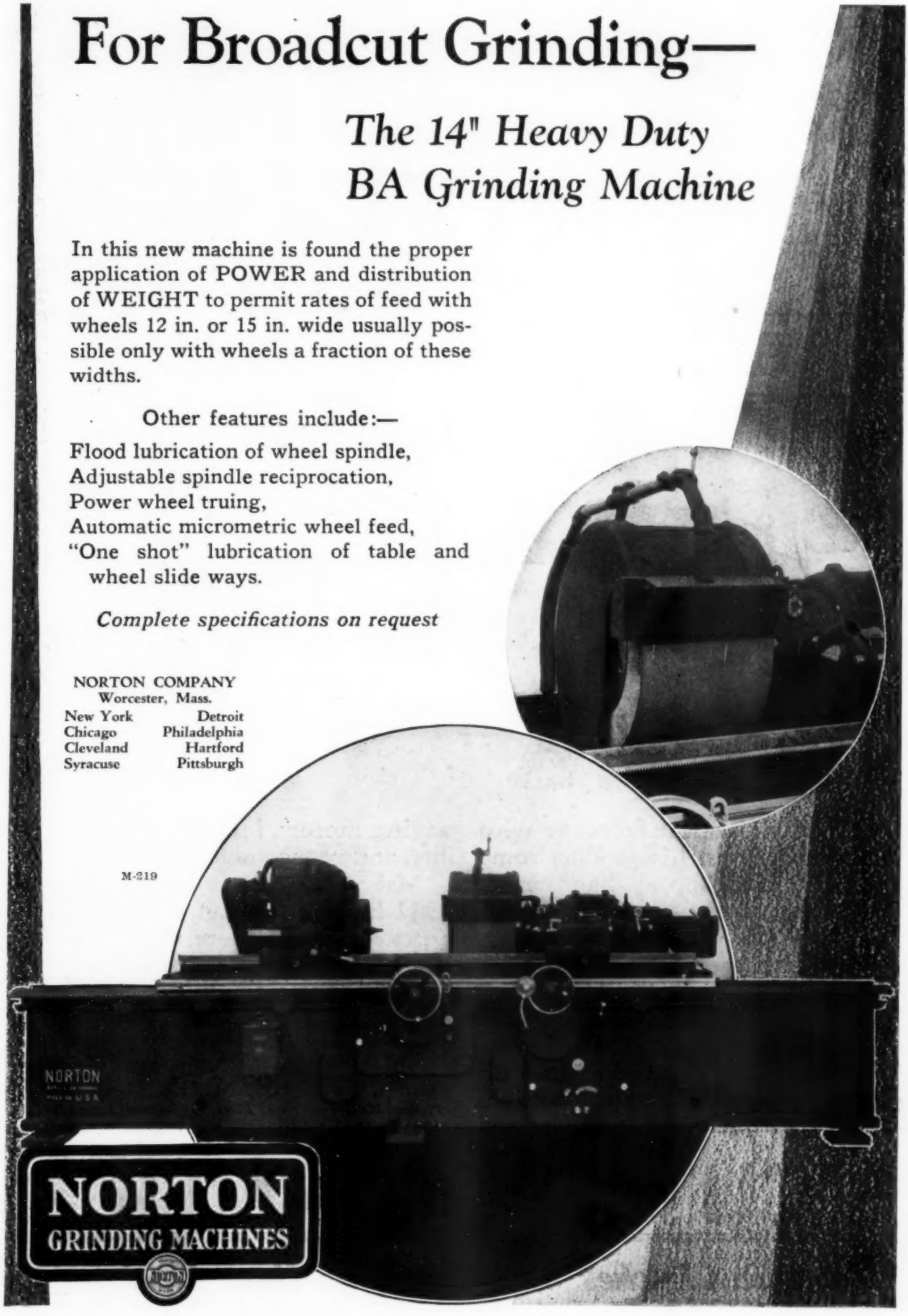
Flood lubrication of wheel spindle,
Adjustable spindle reciprocation,
Power wheel truing,
Automatic micrometric wheel feed,
"One shot" lubrication of table and wheel slide ways.

Complete specifications on request

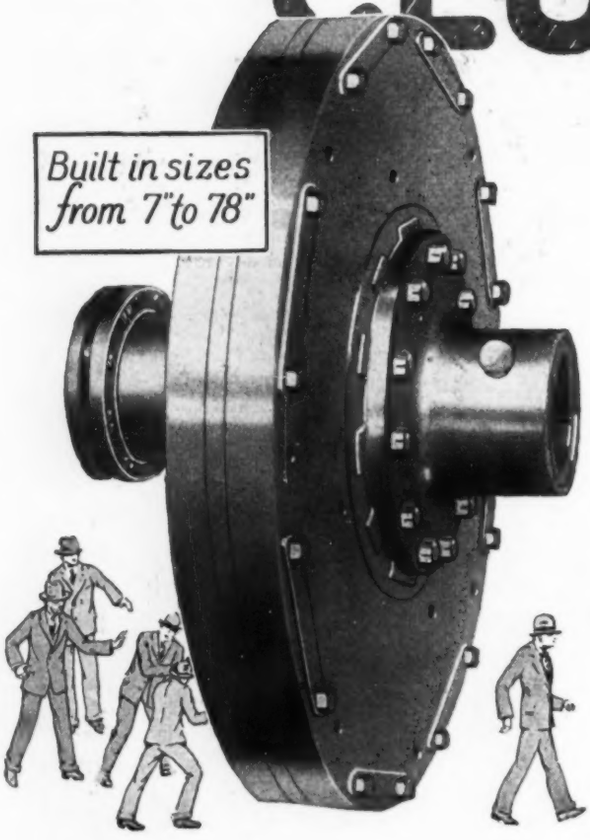
NORTON COMPANY
Worcester, Mass.

New York	Detroit
Chicago	Philadelphia
Cleveland	Hartford
Syracuse	Pittsburgh

M-219



C-H MAGNETIC CLUTCHES



Build up a wall of sales features against price competition

IT IS the manufacturer who embodies in his product some distinct sales appeal that is most successful in escaping competition.

The incorporation of C-H Magnetic Clutches on a machine opens up new sales possibilities. They give smooth, grabless acceleration at the touch of a finger to a push-button. They make simplified design—centralized control possible. They permit wider use of power-saving motors, increase machine life, and reduce maintenance.

Make your request for a C-H Engineer to call, the first step of adding more sales features and greater individuality to your product.

We have a special booklet explaining the use of these clutches on various equipment . . . Request your copy.

The CUTLER-HAMMER Mfg. Co.
Pioneer Manufacturers of Electrical Control Apparatus
1284 St. Paul Avenue MILWAUKEE, WIS.

CUTLER HAMMER

Magnetic Clutches Save Time and Save Equipment

(3240)

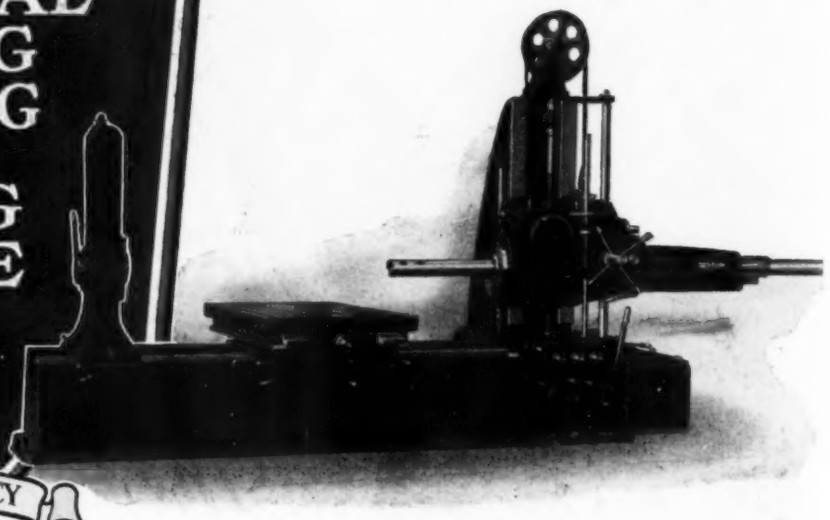
MONARCH Helical-geared Timkenized Lathes have speeded up production and lowered costs in hundreds of America's foremost plants. Their records of economy and reliability merit the consideration of every keen lathe buyer who selects carefully for highest returns on his equipment investments.

THE MONARCH MACHINE TOOL CO., Sidney, Ohio *New York Office:* 857 Graybar Bldg.

NO. 45
HIGH POWER PRECISION
HORIZONTAL BORING DRILLING AND MILLING MACHINE

UNEXCELLED ACCURACY

Another Element in the G&L Method



Specialists in Horizontal Boring, Drilling & Milling

GIDDINGS & LEWIS MACHINE TOOL CO.
Founded 1859
FOND DU LAC, WISCONSIN

Planers—planers only—nothing but planers

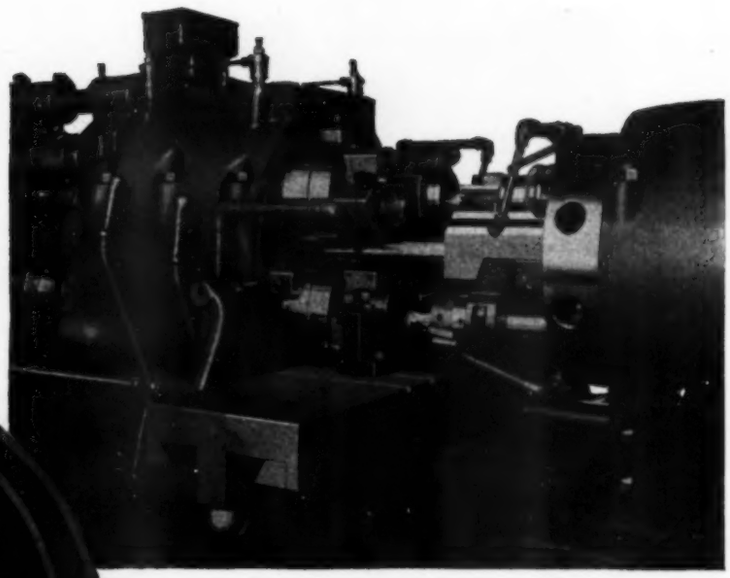
Doesn't it stand to reason that a concern which builds nothing but planers and has built them for over forty-six years must have the experience necessary to build them well? Planers are our sole product. Our entire plant, all our equipment, all our energy, does just one thing and that is—build planers.

Our new shop is the largest plant in the world devoted exclusively to the manufacture of planers, *Open-side and Double-housing.*

Many sizes—but only one quality.

THE G. A. GRAY COMPANY
Cincinnati, Ohio

Smoothing the Roads for Millions



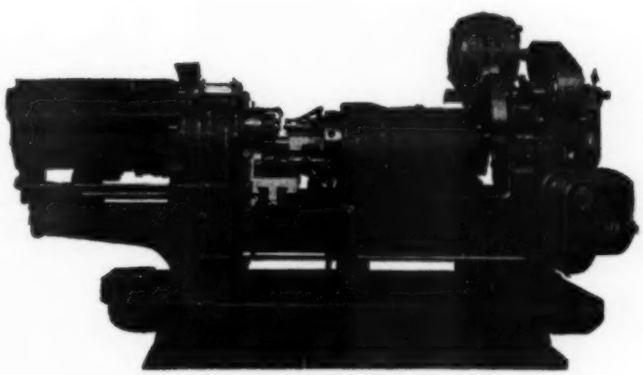
NOW that almost every driver rides in shockless ease, it is only right to tell about the miracle that puts the millions on a par with the millionaires, in riding comfort.

This forged portion of an oil reservoir from a nationally famous shock absorber, is turned out with speed and precision—rough and finish cuts on its various inside and outside circumferences and hole drilled—on a specially adapted four-spindle Model M. Cleveland Automatic Chucking Machine. Cleveland specialization makes hard, slow, cumbersome tasks easy, rapid and simple. Costs tumble, production mounts and the motoring world is made over.

Cleveland Model M. 4-spindle Chucking Machine that serves a prominent manufacturer of shock absorbers.

Send for booklet illustrating chucking machines with special attention to magazine feed.

CLEVELAND AUTOMATICS



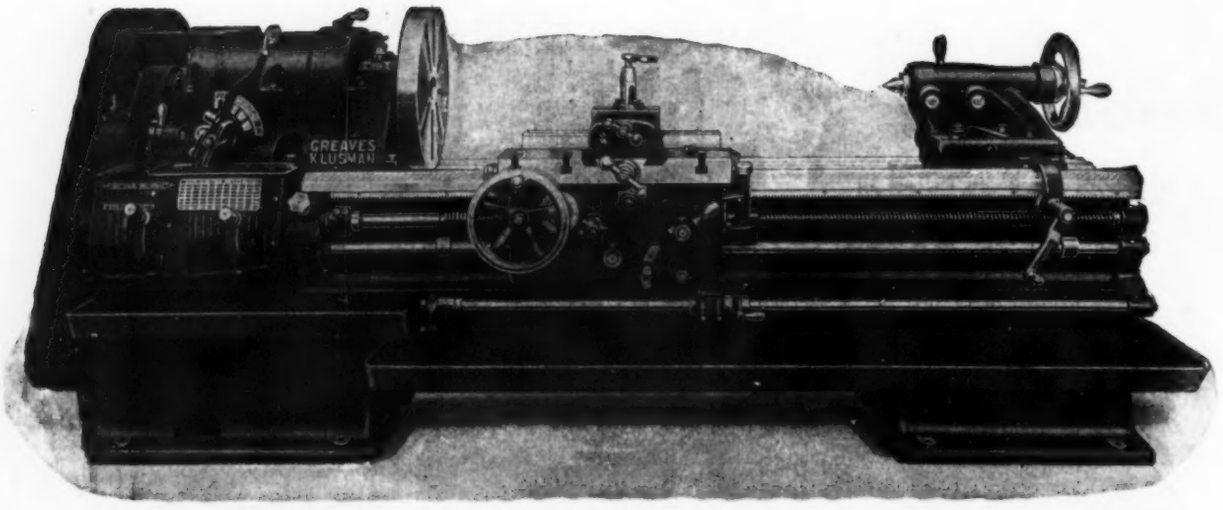
THE CLEVELAND AUTOMATIC MACHINE CO.

2269 E. 65th St., Cleveland, Ohio

NEW YORK
95 Liberty Street

CHICAGO
565 W. Washington Boulevard

DETROIT
1217 Book Building



New Single Lever Control

Production costs are gauged by machining time. By saving operating minutes you lower costs. Operating time is the big factor in G-K Single Lever Control Heavy Duty Lathes.

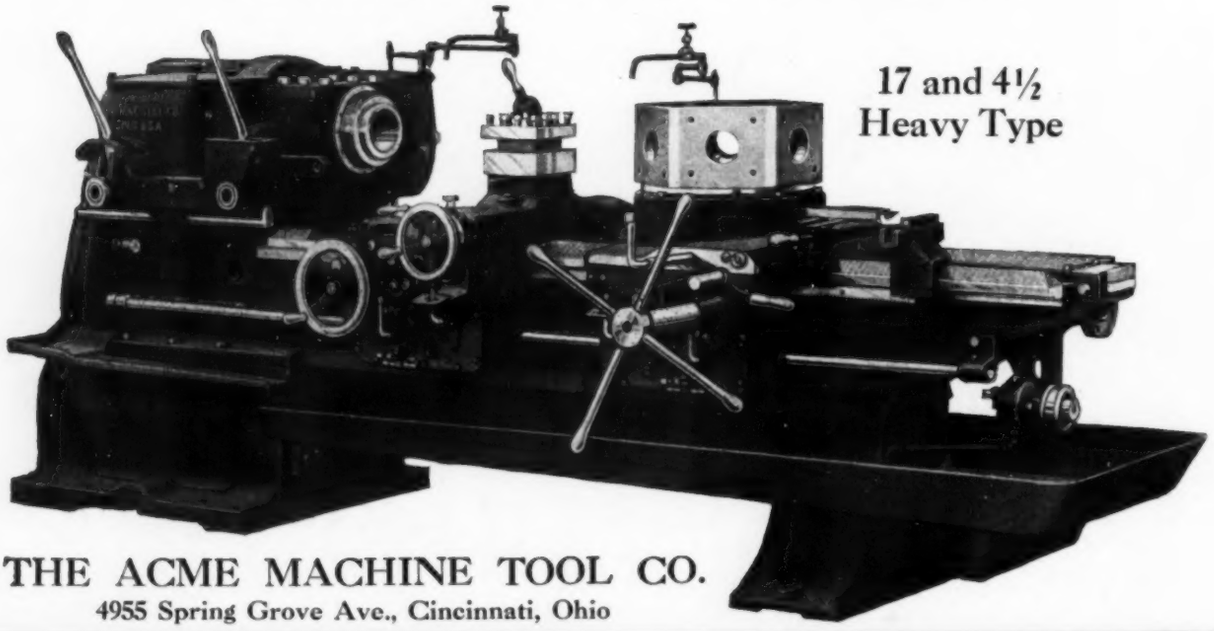
Any one of a wide range of spindle speeds can be obtained through a single lever—instantly—thus enabling any lathe operator to easily hold to set production schedules.

The other production-precision features of G-K Single Lever Control Heavy Duty Lathes are detailed in the Catalog, a copy of which comes for the asking.

The Greaves-Klusman Tool Co., Cincinnati, Ohio

Built to do a bigger day's work, in less time, at lower cost

ACME Duo Control Universal Turret Lathe



17 and 4½ Heavy Type

THE ACME MACHINE TOOL CO.
4955 Spring Grove Ave., Cincinnati, Ohio

CINCINNATI HYPRO PLANERS

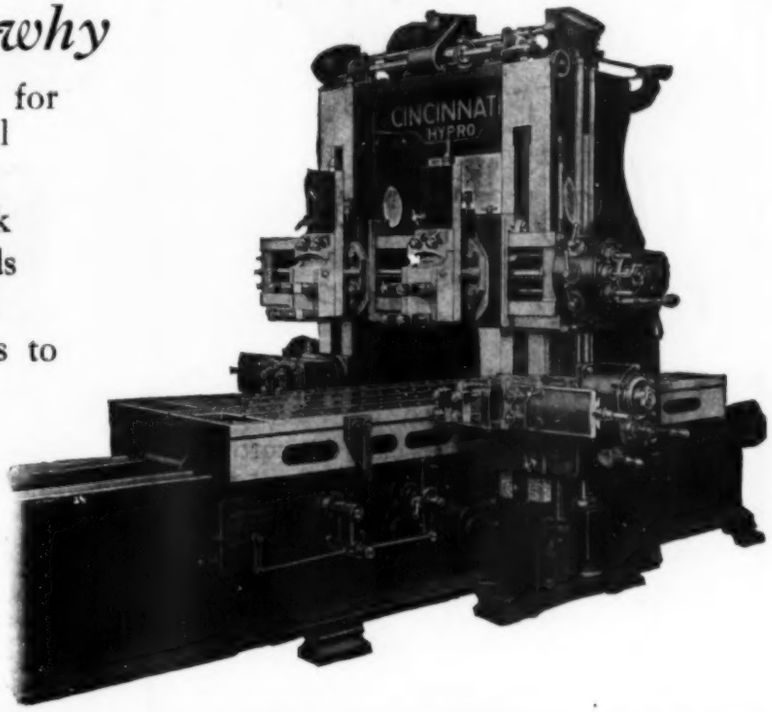
produce more with less operating effort

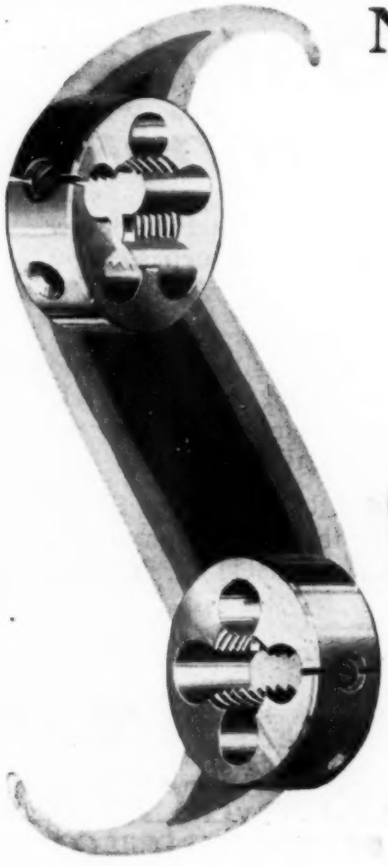
Read on . . . see why

NO unnecessary reaching for levers to move head or Rail
NO Oilers to be forgotten
NO chatter on finished work
NO springing of Rail Heads
NO springing of Side Heads
NO springs or jaw clutches to get out of order.

Send now for the complete story. Ask Hypro Engineers to outline all the advantages of a Cincinnati Hypro Planer installation.

The Cincinnati Planer Co.
Cincinnati, Ohio





No Grief with "Butterfields"—

That's the good news users broadcast about Butterfield Round Dies.

They incorporate all the improvements and niceties of finish discovered in forty-five years of experience on all kinds of difficult threading work.

The adjustments are easy and staple and the specialized heat-treatment they receive keep them on the job long after others have been put to the discard.

Available in all standard sizes for immediate shipment.

BUTTERFIELD THE BETTER TOOLS

BUTTERFIELD & CO. DIVISION
Union Twist Drill Co.

Derby Line, Vt., U. S. A. Rock Island, Quebec, Canada
Stores: New York, 62 Reade St. Chicago, 11 So. Clinton St.
Detroit, 406 E. Woodbridge St. Toronto, 196-198 Adelaide St., West.
Montreal, 111 St. Paul St., West.

BUTTERFIELD

Adjustable Round Dies

They stick to the pace

THE gruelling production pace that is set today by high-powered machining units calls for cutting tools of a superior order. Tools of the "ordinary" class not only fail to carry out the purpose of the machines, but prove extremely costly due to failure.

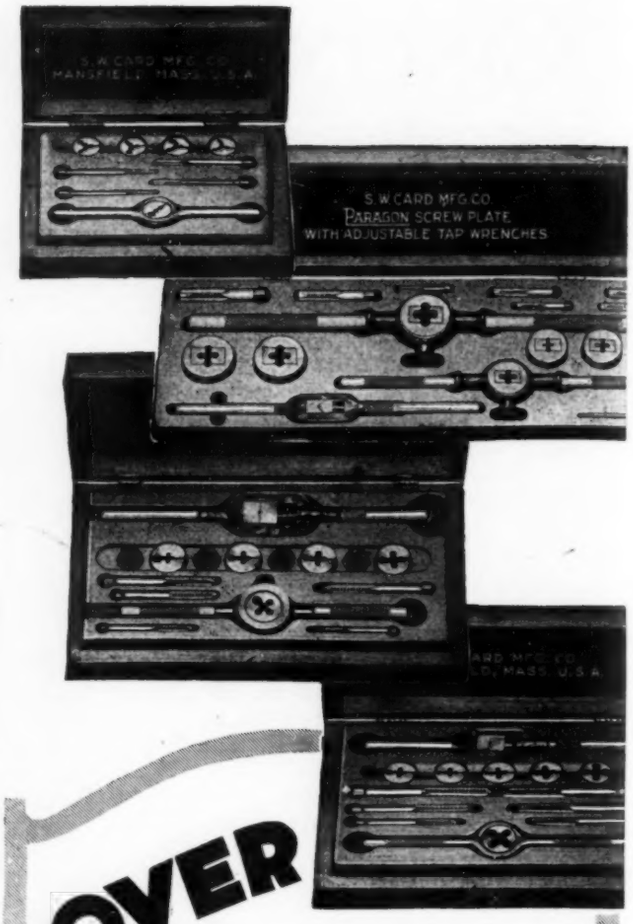
Brubaker Shell End Mills insure the highest output when coupled with modern millers. They shear the metal smoothly and rapidly.

Superior steels give extended service life and scientifically controlled heat treatment guarantees uniformity.

All Brubaker Small Tools possess the same high performance qualities as

BRUBAKER Shell End Mills

W.L. BRUBAKER & BROS. CO
FACTORY, MILLERSBURG, PA.
Sales Office: 50 Church St., New York



OVER 100 *styles to select from*

The CARD Quality Line of Screw Plates is perhaps unsurpassed in completeness.

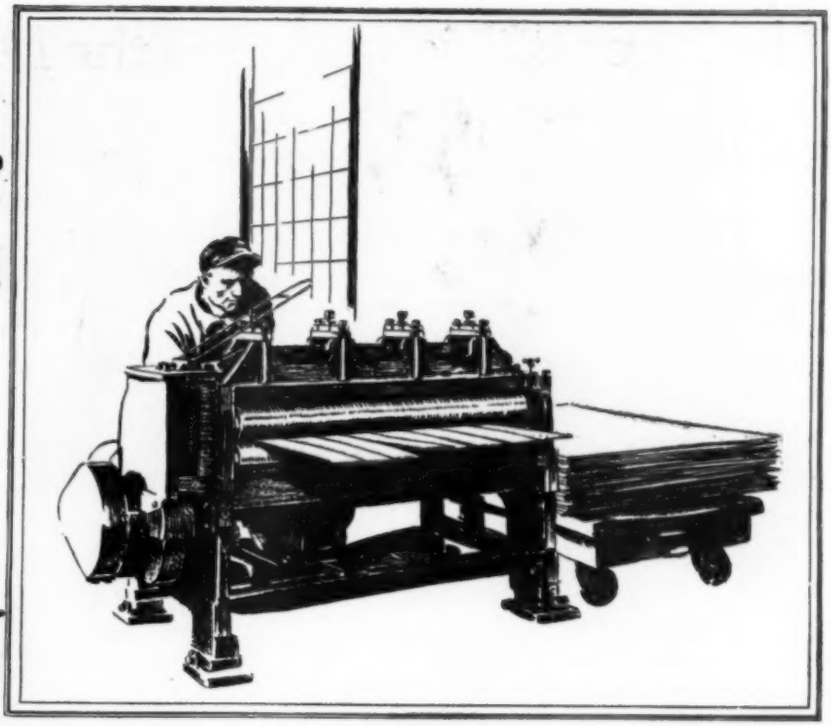
Practically every screw plate requirement can be easily satisfied and economically filled by a CARD Screw Plate Combination of the proper size and style.

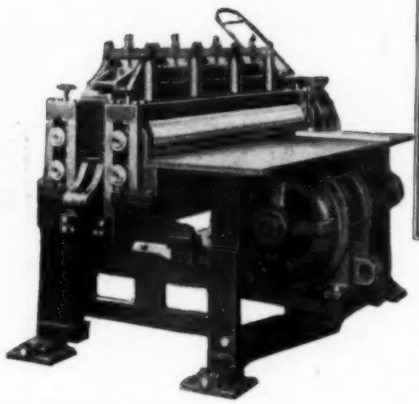
Users of CARD Quality Screw Plates testify that "you'll go a long ways to equal a CARD Screw Plate set."

Catalog No. 32 lists and describes full line.

S.W. CARD MFG. CO
DIVISION OF UNION TWIST DRILL CO.
MANSFIELD, MASSACHUSETTS, U.S.A.

Buy your metal in sheets...





The Putnam Slitting Machine cuts clean, straight edges because of this exclusive feature:

Each cutter is held rigid by individual support transmitting all the stresses to the main frame. The arbors serve *only* as rotating drives for cutters.

...let the Putnam cut your strips and costs

WHY pay some one else to do your slitting, when you can do it at far less cost with the Putnam Rotary Gang Slitting Machine (one of the recently acquired line of Lamb & Nash machines)?

Buy and stock sheets in large quantities, slit them yourself with the Putnam Machine, and you will save a lot of unnecessary expense. This Putnam Machine costs little to buy, and cuts so true and clean that you can utilize your metal up to the very edge.

You cannot afford to be without the Putnam Slitting Machine . . . whether you have a large plant or a small shop. It pays for itself in a remarkably short space of time. Let a Putnam Engineer look over your sheet material requirements and estimate the savings to be gained with this true-cutting, cost-cutting machine.

SHAW PUTNAM

PLANERS—
Open Side, Double Housing, Convertible
BORING MACHINES
MILLING MACHINES
DRILLING MACHINES

•

HEAVY DUTY MACHINE TOOLS—
for Industrial and Railroad Shop Service

•

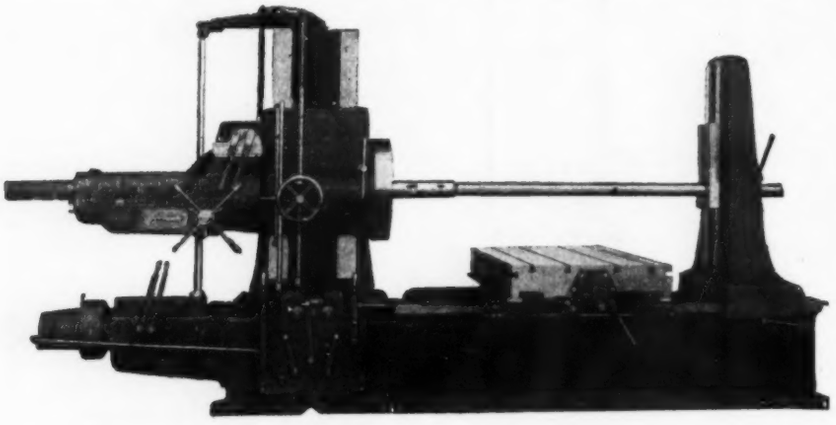
SPECIAL PURPOSE MACHINES

SHAW CRANE-PUTNAM MACHINE CO., INC.
PUTNAM WORKS : FITCHBURG, MASS.
Also Manufacturers of Shaw Electric Cranes—Works: Muskegon, Michigan
General Offices: 100 East 42nd Street, New York, N. Y.

Subsidiary of

MANNING, MAXWELL & MOORE, Inc.

The Most Efficient Man Is the Man With an Idea



and the most efficient machine is the machine made around an idea and not merely to sell. Such a machine is the LUCAS "Precision" Horizontal Boring Drilling and Milling Machine.

"Its Record is our Best Ad."

"PRECISION" Horizontal Boring, Drilling and Milling Machine

Designed, made and sold by

THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND, OHIO, U. S. A.

We also make the LUCAS POWER FORCING PRESS

Set it up, *and finish it!*—

HEAVY parts requiring a series of machining operations prove costly when processed on several machines. Transfer and set-up time frequently balances operating time.

The Defiance Horizontal Boring, Milling, Drilling and Tapping Machine, equipped with a revolving indexing table, is a most profitable tool on such work. It performs various operations with a single set-up of the work.

Set-up time is easily accomplished, manipulation is easy and adjustments are positive.

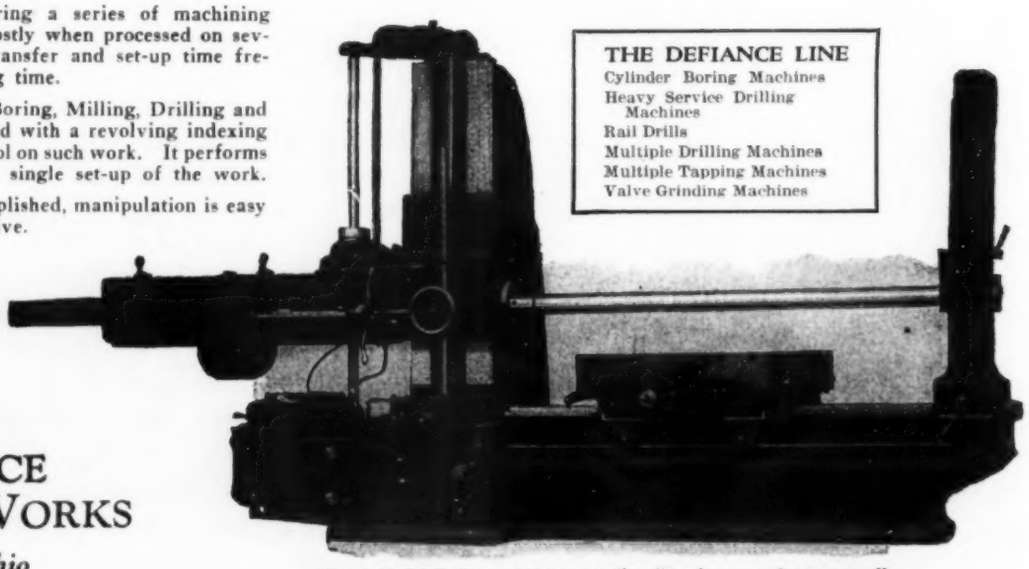
The development of the "Defiance" has been long and progressive. Today it stands as the premier tool in its class.

May we send you full details?

DEFIANCE MACHINE WORKS

Defiance, Ohio

Since 1850



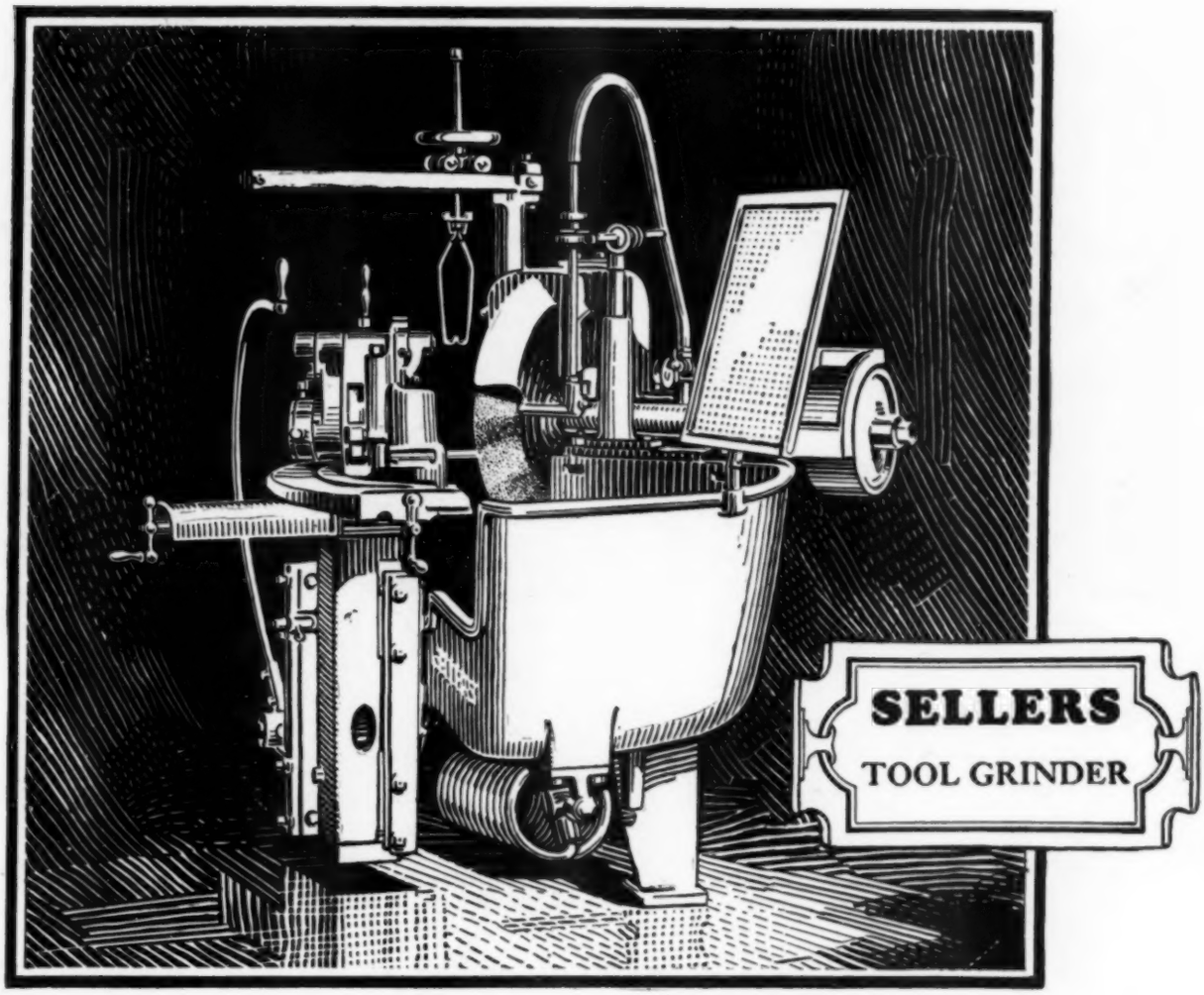
THE DEFIANCE LINE

Cylinder Boring Machines
Heavy Service Drilling Machines
Rail Drills
Multiple Drilling Machines
Multiple Tapping Machines
Valve Grinding Machines

No. 6 Model Defiance 4½-in. spindle. We also manufacture smaller sizes—No. 5 with a 3-in. spindle, and 5A using a 3¾-in. spindle.

DEFIANCE

BORING — MILLING — DRILLING AND TAPPING MACHINES



Grind your Tools Uniformly

Tool steel is expensive. Do not grind it away needlessly. The Sellers Tool Grinder duplicates the exact required angles and shapes of cutting tools and grinds away only the minimum amount of metal necessary to restore the correct shapes. It is a double-purpose machine in that it produces new tools from rough forgings as readily as it retouches the daily run of dull tools. It is unusually easy to operate.

A Sellers Tool Grinder in your tool room will assure you of tool-uniformity — and will effect savings of cutting time and tool steel that are truly remarkable.

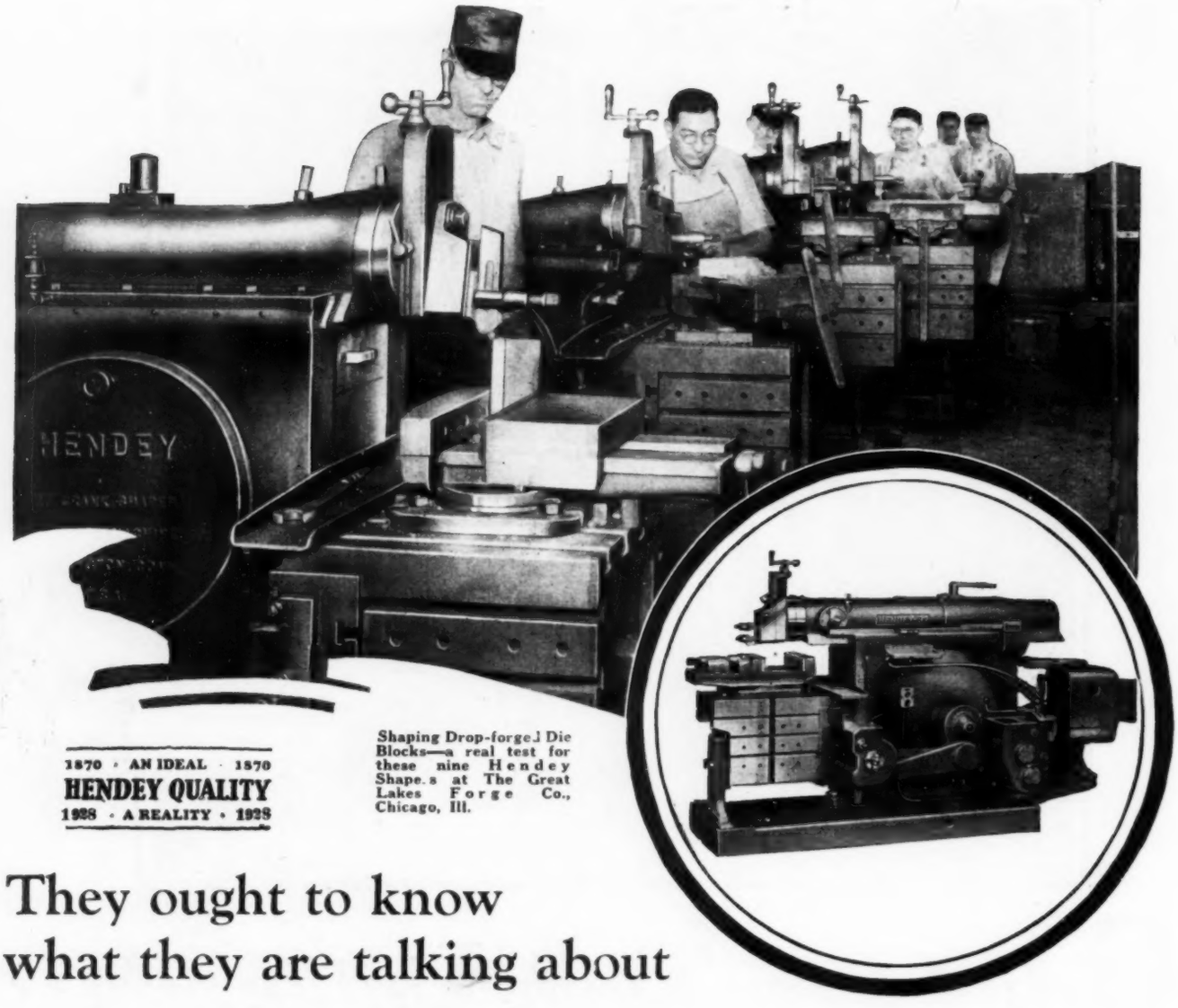
Sellers Tool Grinders are built in two sizes — for tools up to 3" x 3" section, and for tools up to 2" x 1½" section. A bulletin describing their many distinctive features will be mailed at your request.

We also manufacture:

Planers; Drill Grinders; Large Boring and Turning Mills; Floor Boring and Milling Machines, both floor plate and planer type; Slotters; Sand Aerators for foundries; Railway Shop Tools.

WILLIAM SELLERS & CO. INCORPORATED

Philadelphia, U.S.A.



1870 · AN IDEAL · 1870
HENDEY QUALITY
1928 · A REALITY · 1928

Shaping Drop-forged Die Blocks—a real test for these nine Hendey Shapers at The Great Lakes Forge Co., Chicago, Ill.

They ought to know what they are talking about

"The Hendey 32" Shaper and other sizes in our plant have given excellent results in cutting costs on forge and trim Dies. We feel safe in saying that they are the last word in Shapers."

This company—The Great Lakes Forge Company, West Pullman, Illinois, operate nine Hendey Shapers on production work. The work is chiefly that of finishing Die Blocks to specifications for the automotive industry, who demand low costs and high efficiency because they practice it themselves.

The New Hendey 32-in. is a marvel of advanced engineering. It combines force-feed "metered" lubrication to every wear point, positive table support that will not "give" under the heaviest strains. Then there is the Servo Clutch—a velvet smooth control unrivalled in easy engagement and quick "make and break." Timken Bearings carry the whole Bull Gear mounting. There are many more features listed in Bulletin S-332—you'll want a copy for your files!

LATHES
SHAPERS

HENDEY
MACHINE CO., TORRINGTON, CONN.

MILLING
MACHINES

Here LANDIS is the Choice of 40 Years' Experience

The American Tube Works, of Somerville, Mass., is the pioneer plant of the seamless steel tube industry and was established in 1851. Among its products, this company manufactures a large quantity of brass and copper nipples for plumbing and steam fitting supplies.

The job illustrated is a typical ⅛-in. x 2½-in brass nipple, threaded ¾-in. long on both ends. A ⅛-in. LANDIS Single Nipple Threading Machine turns these nipples out at the average rate of 110 per hour. For best results, the chasers are ground once every 10 days, or approximately once every 10,000 nipples or 20,000 threaded ends. In this shop there is also a 1¼-in. LANDIS Single Pipe and Nipple Threading Machine for the short, changing runs, which is operated with equally efficient results.

Mr. F. G. Thurston, Master Mechanic, was asked what he thought of his LANDIS Machines. He quickly replied:

> "I know the LANDIS line, and if I didn't think well of them I wouldn't have bought them. I consider them the equal or superior of any threading machine made."

And when we learn that Mr. Thurston has been in this business for over 40 years, "what he thinks of LANDIS equipment" carries some weight, does it not?

LANDIS MACHINE COMPANY, Inc., Waynesboro, Pa.

Detroit Office: 5928 Second Blvd.

DOMESTIC AGENTS: Marshall & Huschart Machinery Co., Chicago, Ill.; Marshall & Huschart Machinery Co. of Indiana, Indianapolis, Ind.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; R. B. Whitacre & Co., St. Paul, Minn.; Hamilton Machinery Co., Chattanooga, Tenn.; Young & Vann Supply Co., Birmingham, Ala.; Woodward, Wight & Co., New Orleans, La.; D. S. Mair Machinery Co., Houston, Texas; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Salt Lake Hardware Co., Salt Lake City, Utah; Herberts Machinery & Supply Co., San Francisco and Los Angeles, Calif.; Harry M. Euler Co., Portland, Ore.; Hallidie Machy. Co., Seattle, Wash.; Hallidie Co., Spokane, Wash.

CANADIAN AGENTS: Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg, Vancouver.

FOREIGN AGENTS: Benson Brothers, Ltd., Sydney; Schuchardt & Schutte, Berlin; Vienna; R. S. Stokvis & Zonen, Rotterdam; Brussels; M. Almeida & Cia., Sao Paulo, Rio de Janeiro; Alfred Herbert, Ltd., Coventry; Calcutta; Osaka; Burton Fils, Paris; D. Drury & Co., Johannesburg; Akt. C. A. Horstad, Copenhagen; Ing. Ercole Vaghi, Milan; Allied Machinery Co., Barcelona; Zurich; Akt. Gunnar Ekstrom, Stockholm.

NEW BRITAIN
Smooth Top
STEEL BENCHES

At Last~
A Smooth Top Steel Bench!

Exactly as in all other Steel Shop Furniture, it has been the privilege of this company to originate and put on the market the first Smooth Top Steel Bench. This bench has a top that is *perfectly smooth*. No bolt or screw heads protrude to catch dirt or endanger the operators' hands. This and many other advantages are exclusively New Britain.

The New Britain Smooth Top Steel Bench is built of standard and interchangeable parts, is quickly and easily erected. Several lengths and widths make selection easy for your particular needs.

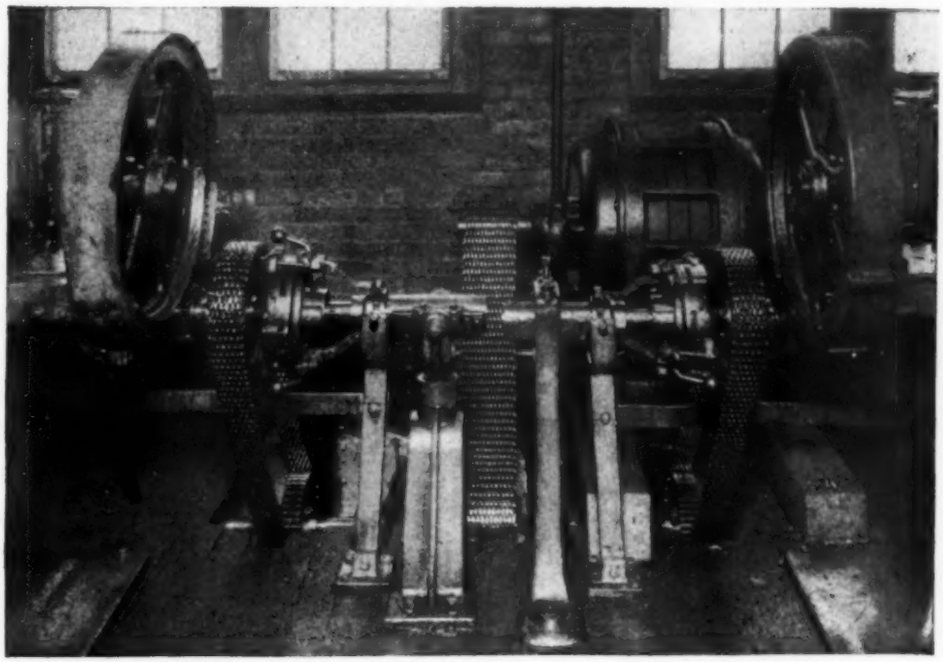
The New Britain Smooth Top Bench is in keeping with the modern trend in benching. It eliminates fire hazards, as it will not soak up oil. It will not splinter or warp, or rock because of twisting. It is the last word in benching.

Our new bulletin on Steel Benching will give you the facts and interestingly low prices. Send for it now.

Shop Furniture Division

THE NEW BRITAIN MACHINE CO., New Britain, Conn.

"WHITNEY" Chains at Critical Points



The above illustration shows what one steel plant has done towards providing an efficient drive from the motor to a series of cold finishing mills. The secondary drive to each mill is also "WHITNEY" Silent Chain.

Intermittent power loads with heavy demand makes this a difficult problem for any other form of drive. This was an original belt drive, but "WHITNEY" Silent Chains have permitted us of short centers, with marked savings in space and beter overhead lighting arrangement, as well as increased production from the mills due to positive transmission of power from the main shaft to each individual mill, when required. No slip to "WHITNEY" Chains.

Our nearest sales office can help you.

"WHITNEY"
SILENT CHAIN DRIVES

THE WHITNEY MFG. CO., Hartford, Conn.

SALES AND ENGINEERING OFFICES

NEW YORK
L. C. Biglow & Co., Inc.
250 W. 54th St.

BOSTON
The Whitney Mfg. Co.
711 Boylston St.

PHILADELPHIA
The Whitney Mfg. Co.
133 So. 36th St.
Philadelphia Gear Works
Erie Ave. and G St.

SYRACUSE
George McPherson
201 Norwood Ave.

CHICAGO
The Whitney Mfg. Co.
549 W. Washington Blvd.

PITTSBURGH
Pittsburgh Gear & Mach. Co.
27th & Smallman Sts.

CLEVELAND
Smith Power Transmission Co.
1213 W. Third St.

DETROIT
The Whitney Mfg. Co.
2-240 General Motors Bldg.

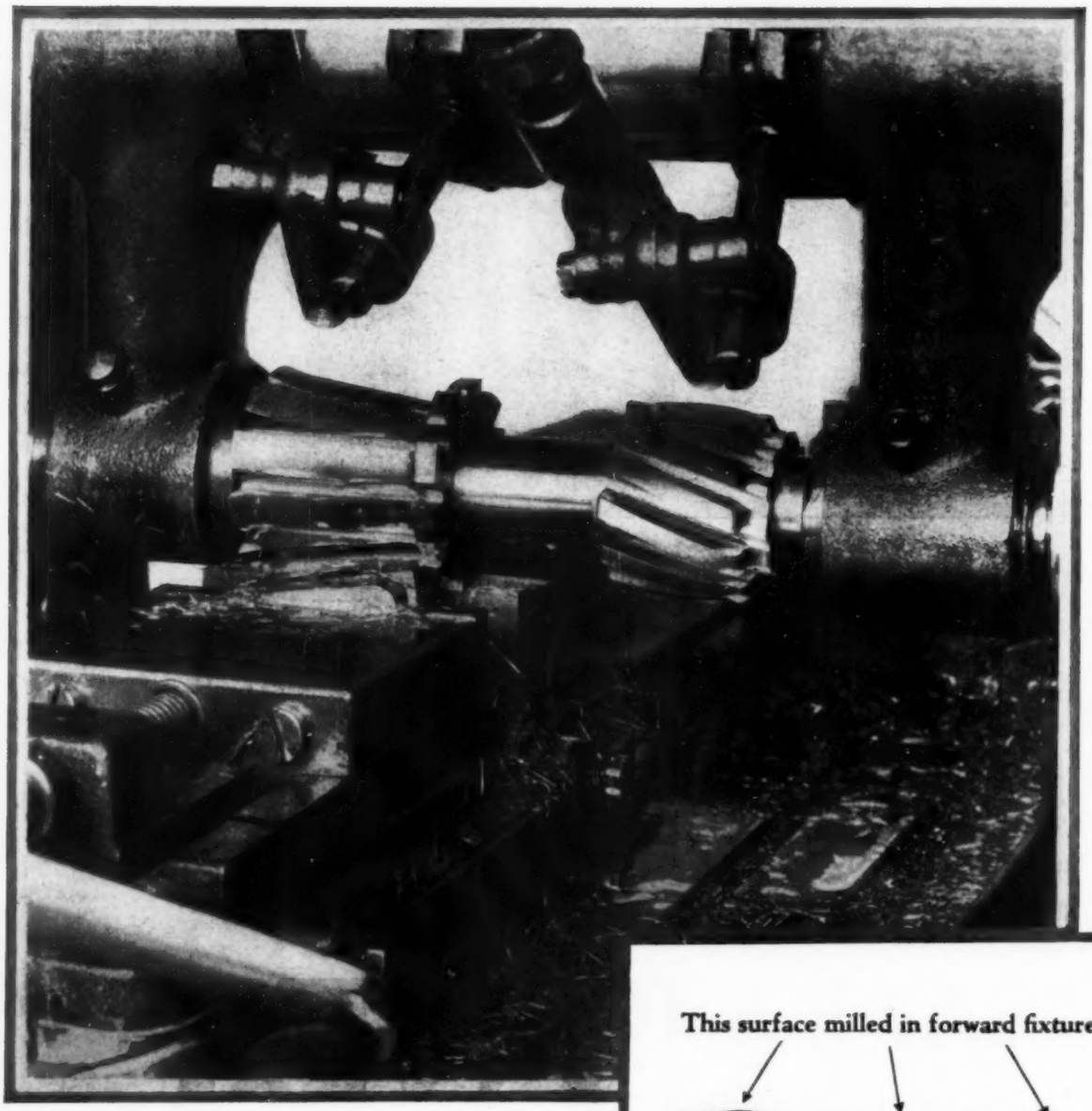
SAN FRANCISCO
A. H. Coates Co.
615 Howard St.

SEATTLE
A. H. Coates Co.
1743 First Ave. So.

LOS ANGELES
L. A. Automotive Works
1020 Towne Ave.

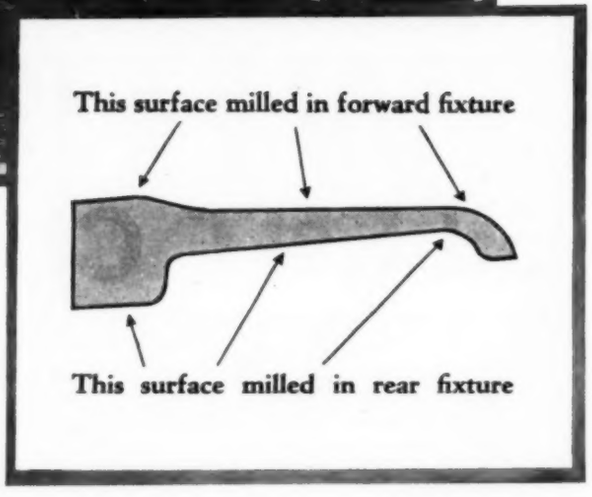
PORTLAND, ORE.
Portland Iron Works
495 Northrup St.

TWO *Operations*—ONE



The operator loads one fixture while the piece in the other is under cut. He takes the piece with one side milled from the forward fixture and places it in the rear one. The opposite side is milled during the second half of the table cycle. All table movements are automatically controlled by dogs.

The automatic reversal of the spindle between cuts enables the most advantageous cutting direction on the pieces in both fixtures.



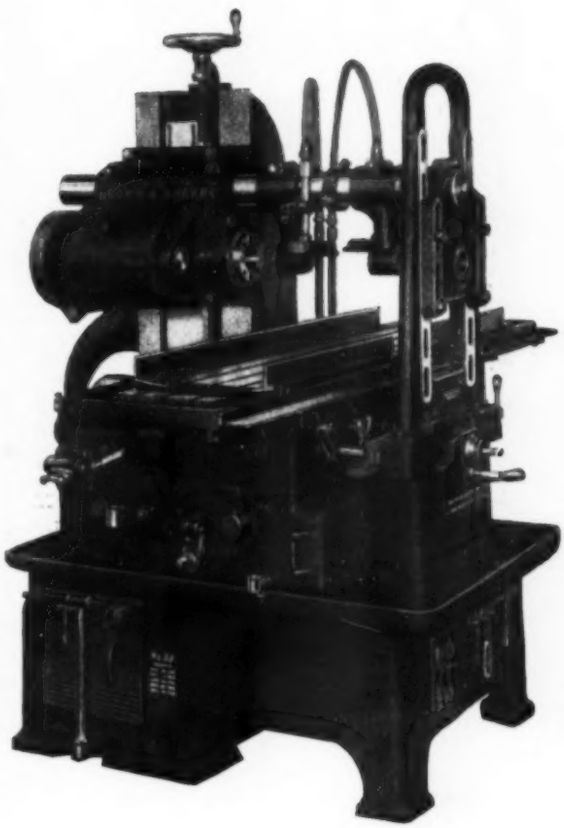
Machine—a finished piece each complete cycle of the table

The spindle reverse and other automatic features of the Brown & Sharpe No. 33 Automatic Milling Machine enable one machine to do the work of two

MILLING the piece illustrated required a forming cut on each of two opposite sides. By using a fixture for each operation, one at each end of the table, both of these forms are milled on the same machine. Thus, one piece is finished during each cycle of the table.

Large quantity production of this piece, which is tool steel, would ordinarily require two machines. The automatic features of the No. 33 make it possible to handle both operations on one. There is a saving in floor space and more important, an appreciable saving in labor and equipment costs.

The Brown & Sharpe Milling Service Department can recommend machines and design and build set-ups that will save time and costs in your milling department. Ask our representative about this service.



BROWN & SHARPE

BROWN & SHARPE MFG. CO. PROVIDENCE, R. I., U. S. A.

"Two Days After Christmas"—The Super

It's two days after Christmas now, and my little eight-year-old has become pretty well acquainted with his new toys. So have I. In fact, I have bumped my shins on fire-engines and tripped over track and cars and tin soldiers until my power for restraint has gotten a bit worn out, quite a bit, to be honest.

I told him that he must put some of the things away or I'd have to do something about all of them.

"No place to put them, Dad," he came back at me. "Not unless you will throw away a lot of the old ones that are all worn out. I've heard you talking with Mr. Kennedy about throwing the old machinery out of your factory. Why make me keep all my old toys?"

Now there was a good one. Kennedy and I have spent many evenings at my home talking over ways and means, while the boy has been around. It did not occur to me that he was taking in anything we said, but evidently his ears were open.

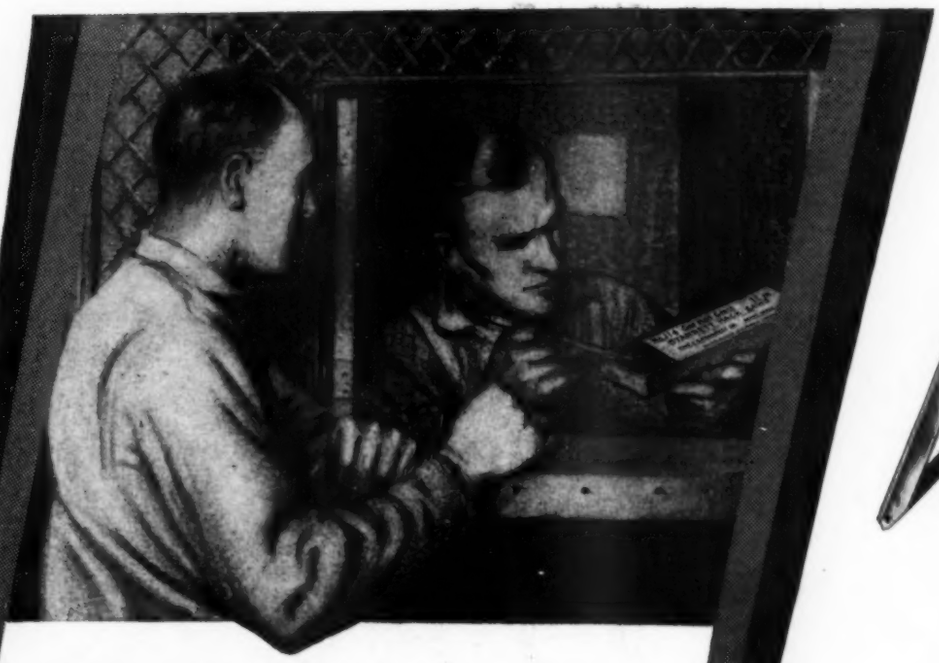
What did I do? Right then and there we combined our forces, the boy and his old man, and we made an equipment inventory. A big box constituted our department for obsolete items and a smaller box was for equipment to be up for repair.

It was, altogether, a lot of fun for both of us and it was particularly interesting to me to hear him discuss the possibilities for permanent repair against the wisdom of discarding. Of course, his judgment was based on my past performance in fixing things about the house, but when all is said and done, repaired breakdowns are very seldom comparable with new replacements.

"Besides, Dad," said my boy, "the new things you can get have many better jiggers on them and they're built stronger, just as the things are that you and Mr. Kennedy talk over. We'd better throw that old business in our 'obsolete' box.

"That's what you are going to do in your own shop. You told Mr. Kennedy so and he said, 'fine'."

And, by George, the boy is right. This year of 1929 is to see many replacements in the shop of things that are old and out-of-date.



You bet they're good —they're Starrett's

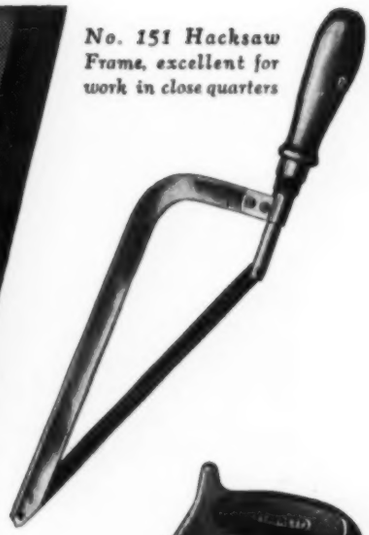
Starrett Hacksaw Blades rightly deserve the same high respect and confidence that American Machinists have given to Starrett Tools. They live up to Starrett standards of workmanship and performance.

Starrett Hacksaws cut quicker and last longer.

It pays to ask for Starrett Hacksaws and see that you get the genuine. Write us for a copy of the famous Starrett Hacksaw Chart and Starrett Catalog No. 24 "C."

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS., U. S. A.

The blades for super service—Starrett High Speed Hacksaws. Have you tried them?



No. 151 Hacksaw Frame, excellent for work in close quarters

No. 153 Pistol Grip Frame. Sturdy, convenient, low in price.

No. 146, a popular and substantial frame.

No. 169 Easy Grip Frame of exceptionally fine design, adjustment, rigidity and 'hang'

Use Starrett Hacksaws

2392

Buyers From Everywhere

All of the world that matters—industrially . . . commercially . . . artistically will see and appreciate the exhibit of American Machinery Manufacturers at the International Exhibition of Barcelona, Spain, 1929.

The Exhibition of Barcelona, 1929, is the American manufacturer's gateway to win, not only the rich, fertile Spanish market (Spain is third wealthiest of world powers), but also to attract and interest the buyers of the twenty-three other countries of the world—who are being urged to attend through a world-wide advertising campaign.

The Exhibition of Barcelona, 1929, is the world's greatest export advertising space.

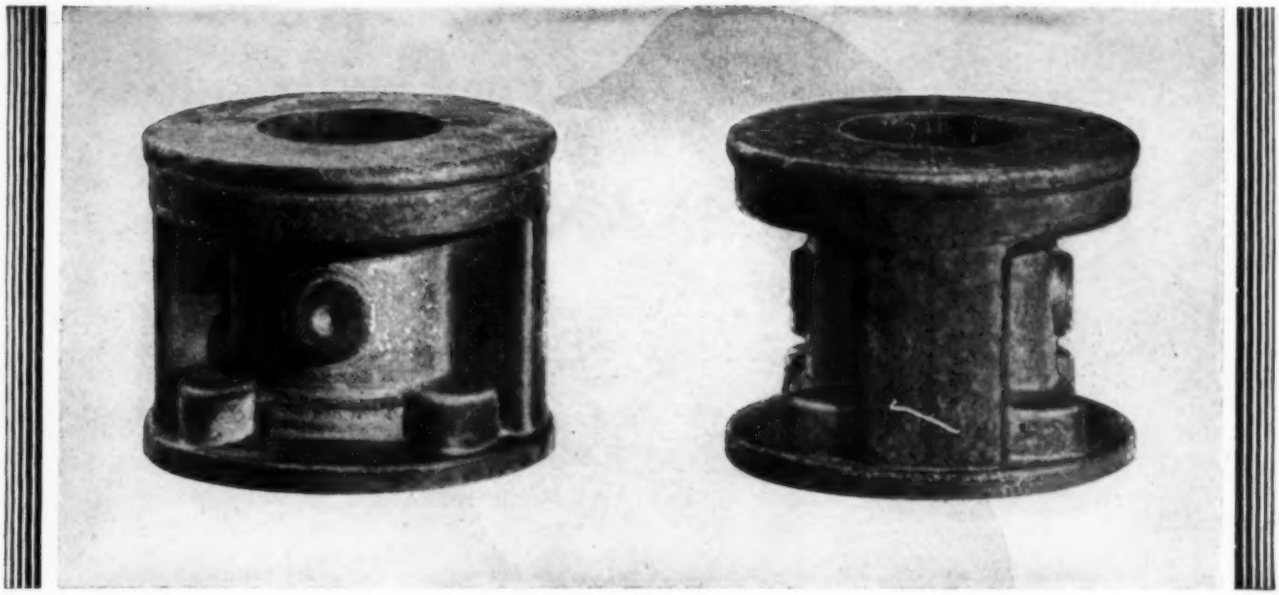
Special low freight rates . . . arrangements for no tariff on materials for exhibit . . . exhibition space without charge for American manufacturers seeking the Spanish market.

Statistics and data on the potentiality of your product in the world markets may be had by writing to the address below:

United States Delegate, Exhibition of Barcelona,
Dept. 285, Steinway Hall, New York City, N.Y.

International Exhibition Barcelona

May—1929—December



ACCURATE FORGING!

Less metal to forge . . .
Less machining to finish

THE prime requisite of this forging is accuracy of size and shape. The recessed surfaces and the drill bosses on the lower flange must be accurately formed. This requirement is met by forging the piece on a new National High Duty Forging Machine. The result is an accurate forging of extremely high quality.

This piece is forged without draft or flash. The only forging waste is the short crop end of the bar. Machining is equally economical. A light cut cleans up the top and bottom faces. The hole is straight and is machined by reaming or broaching. Drilling is eliminated.

This forging is typical of the quality of forgings made on the new National High Duty Forging Machines.

National High Duty Forging Machines
are sold through

CHAMBERSBURG-NATIONAL
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We must "OK" every PHILADELPHIA GEAR before YOU get it!

No gears with blow holes, bad teeth or faulty keyways are allowed to get past our inspection system—which begins at the lathe and runs to the shipping department! And this applies equally to the production of one hundred gears or 10,000. We are specialists in QUANTITY production, gears from 10 in. down—in addition to our famous speedy delivery on "Hurry-Up Orders and Gear Breakdown Jobs." Write for the "gear book" and let us show you what 50 years' experience plus the most modern production facilities can do for YOU.

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PHILLIE GEAR

Power Saving Products

GEARS, Spur, Worm, Herringbone, Internal, Bevel, Miter, Intermittent, Spiral, Helical.

NON-METALLIC PINIONS: Fabroil, Textolite Rawhide.

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SPEED REDUCING UNITS

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PHILADELPHIA GEAR WORKS

Manufacturers of Industrial Gears and Speed Reducing Units

PHILADELPHIA, PENNA.

Branch Sales and Engineering Office: 12 E. 41st St., New York

See How We've Tried To Deserve Your Gear Business

Gear Cutting to your specifications is not just a "fill-in" with us — it's a specialized, self-contained division of our business.

Every Gear Cutting Machine is of the latest type — motor driven — and housed in a modern daylight shop.

That means all the economies of up-to-date machinery and modern management is passed on to you in the shape of fair prices and prompt deliveries.

Small orders are just as welcome as large ones — for SERVICE is the only basis we recognize as deserving consideration.

Prices cheerfully quoted — let the orders fall where they may.

SPUR GEARS
CAM CUTTING
BEVEL GEARS
WORM WHEELS
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Immediate Delivery
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24 Hour Delivery on Fabroil, Bakelite and Rawhide Pinions.

We have made a specialty of rush service on noiseless pinions for twenty-five years.

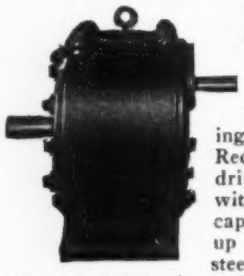
Try us.

We also manufacture a complete line of speed reducers and industrial gears.

The Horsburgh & Scott Co.

5114 Hamilton Avenue — *"Gear makers since '89"* — Cleveland, U. S. A.

Gears for Every Industrial Purpose—Worm—Bevel—Herringbone—Spur—Spiral—Hardened Heat Treated Gears—Non-Metallic Gears and Pinions



It's new— It's different

Not new in service, but in its offering to the field. The Morrison Speed Reducing Unit is so designed that its driven spindle may be readily aligned with that of any type of motor of like capacity. No extra base or blocking up necessary. All steel helical gears. Oil bath lubrication. Ball bearings or Timken Roller Bearings, throughout. Standard types permit of reductions from 2:1 to 729:1. Specials on order. *Circular contains full information.*

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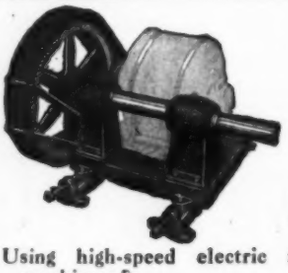

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Speed Reducer

Many Sizes Up to 50 H.P.
Many Ratios

Rigidly links the electric motor to driven machinery.

Using high-speed electric motors to drive slow-speed machinery?
Ratios above 2:1 causing trouble?
Belt and counter shaft maintainance high?
Then back gear with Bridgeport.

THE BRIDGEPORT MOTOR CO., INC.
105-A Kossuth St., Bridgeport, Conn.
We do not build or deal in electric motors.

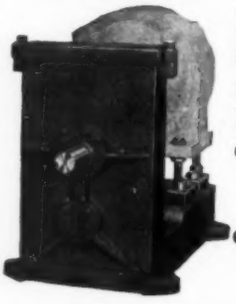
SIMONDS GEARS
Accurately Cut to Standard Forms

CAPACITY:
SPUR GEARS, 144-in. Diameter.
BEVEL GEARS, 56-in. Pitch dia.
WORM GEARS, 46-in. Pitch dia.
WORMS, 12-in. PD., 3½-in. CP.
RACKS, 3½-in. CP.

Write for lists of HOBS

The Simonds Mfg. Co., Pittsburgh, Pa.
"Try Simonds Service"

CULLMAN SPEED REDUCERS



Reducer and motor built into one unit. Takes little room. Easy to install. Made in seven sizes. Reduction 6-1 to 1017-1.

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Cut Spur, Bevel and Worm Gears
All sizes. Every description. Operating Machinery for Bridges, etc. "Lea Simplex" Cold Metal Saws.

Ready to accept orders for immediate attention

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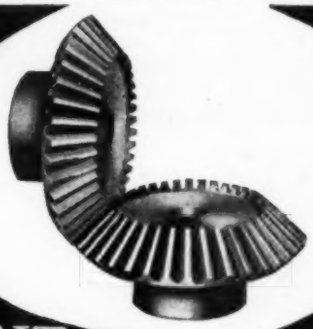

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Roller Chain Drives
Silent Chain Drives
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Established 1877 Boston, Mass.

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Ground Tooth Gears in Stock!

These *highly efficient* hardened and ground gears for industrial purposes at *low cost.*

Boston hardened and ground gears are now available from stock for *immediate delivery.*

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And you'll get more than just gears! You'll get gears backed by the long experience of our Engineers. Gears made in a modern plant by skilled workmen. That is Meisel Gear Service.

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OUR job is making gears that will meet your requirements. And we're not patting our backs when we say that Cincinnati Gears "fill the bill."

For over twenty-two years Cincinnati Gears have been specified by those users who know and demand **good gears.**

Gears of every description

Fabroil
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Firms like these are saving 30 to 50% of their acetylene and oxygen costs with WELDIT GASAVERS

WELDIT ACETYLENE CO
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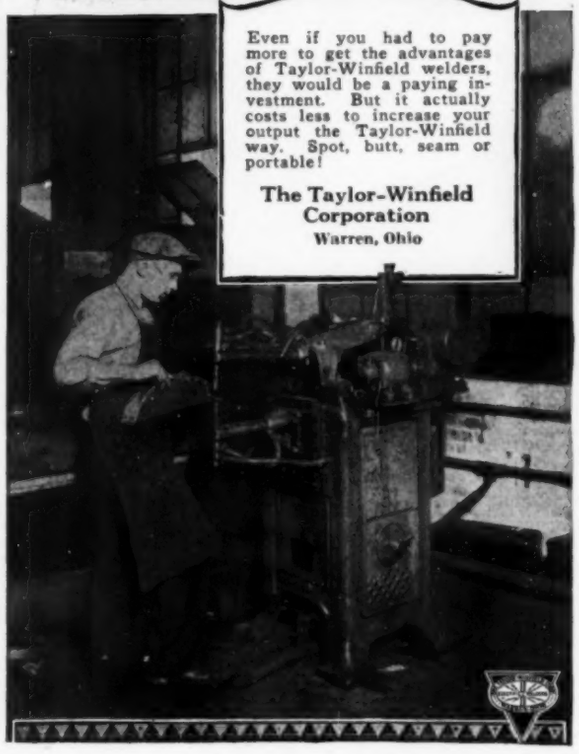
TAYLOR-WINFIELD WELDERS



Even if you had to pay more to get the advantages of Taylor-Winfield welders, they would be a paying investment. But it actually costs less to increase your output the Taylor-Winfield way. Spot, butt, seam or portable!

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The Superior Quality of
"FEDERAL" WELDERS
Has Never Been Questioned

Complete line of electric spot, butt and seam welders, standard or special

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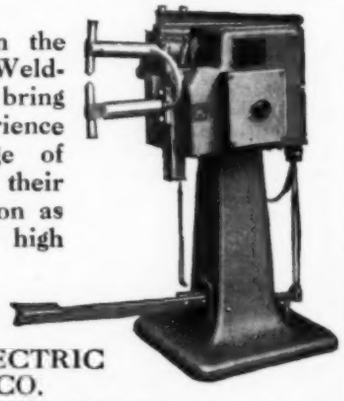
Recognized leaders in the development and production of resistance welding machines.

As pioneers in the process of Electric Welding, we naturally bring an unexcelled experience and a wide range of models as noted for their economy of operation as they are for their high output.



Let us help with your welding problems.

THOMSON ELECTRIC WELDING CO.

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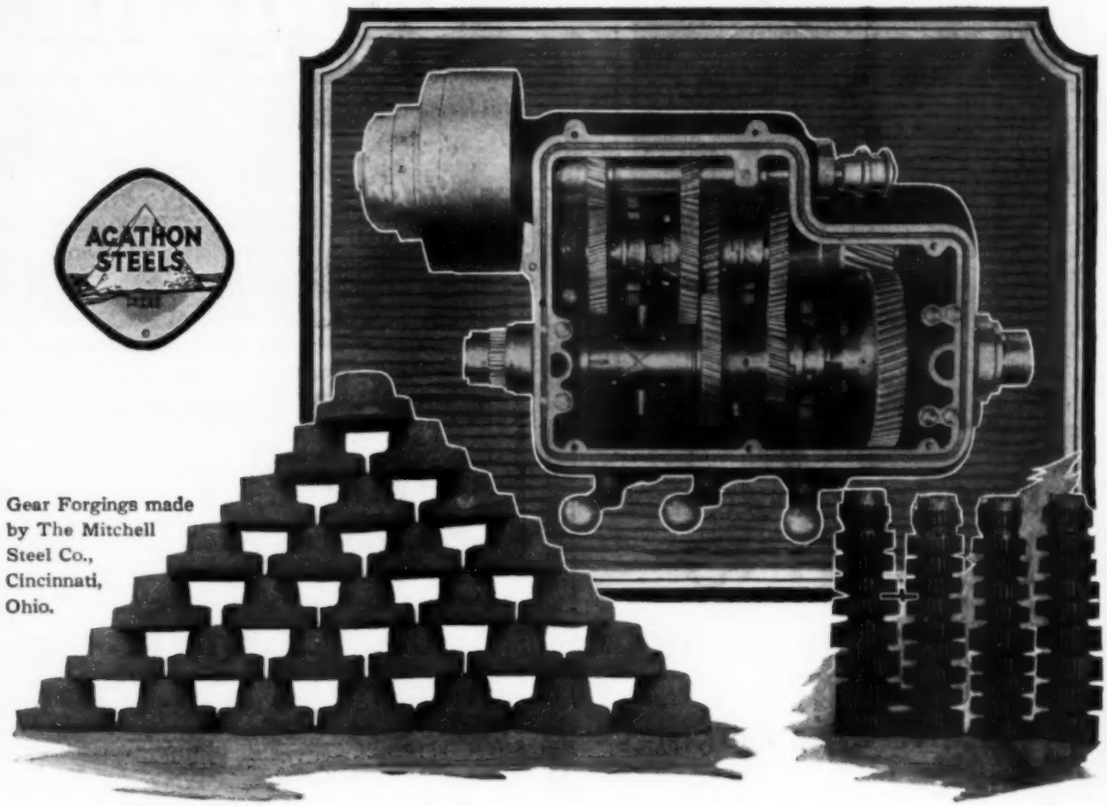

Gear Forgings made by The Mitchell Steel Co., Cincinnati, Ohio.

"Tailor-Made" Gear Steels

LEADING machine tool manufacturers have standardized on Agathon Alloy Steels for gears and other parts subjected to excessive wear, severe stresses and strains. They appreciate the fact that these steels can be obtained "tailor-made" to meet the peculiar requirements of various machine tool parts.

If you have a problem in steel for any part of your product let our metallurgists help you solve it. The answer may be in an analysis of steel in daily production. If not, we will formulate a steel to meet your individual requirements without charge.

Have you a copy of our Agathon Alloy Steel Handbook?

The same men who make Agathon Alloy Steels produce Toncan Copper Mo-lyb-den-um Iron and Enduro Stainless Iron, materials sponsored by Central Alloy Steel Corporation, largest and most highly specialized alloy steel producers.

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World's Largest and Most Highly Specialized Alloy Steel Producers

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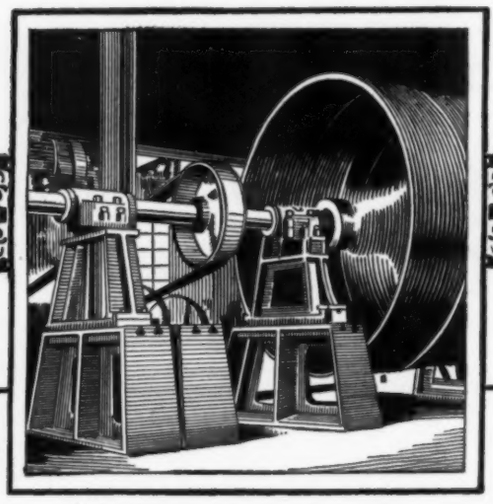
USE THE RIGHT STEEL FOR THE RIGHT PURPOSE



Turned and Polished SHAFTING *for* Every Requirement

ACCURATELY straight, true-to-round, precise in length and finely surfaced, Union Turned and Polished Shafting is produced with extreme care by equipment of our own special design and under expert and long experienced supervision.

It is especially characterized by uniformity and close tolerance in order that its use, in every instance, will promote the greatest mechanical efficiency.

Sizes range up to and including 8 inch diameter.

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Beaver Falls, Pa.

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Columbia TOOL STEEL

FINE STEELS made by the CRUCIBLE PROCESS
CLARITE HIGH SPEED STEEL
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It pays to use Good Tool Steel.

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Wolfram High Speed, Vulcan Special Vanadium, Straight Carbon and Special Steels. Uniformity and Vulcan are synonymous.

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Vanadium Alloys Steel Co.
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Highest Quality—Best Practice
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Rounds—Squares—Hexagons—Flats
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95,000 blanks
and still good for more!

We are pleased to furnish you with information concerning our use of your HYCC steel.

We find in hardening there is no noticeable change and therefore we are able to enter templates without stoning process usually necessary. This together with increased production makes HYCC profitable to use.

The die submitted for photograph is made from your HYCC 7" x 1-1/4" and blank parts .065 cold rolled steel.

The last run on this die was 95,000 pieces with all blanks free from noticeable burr.

In the light of this experience as above related we are happy indeed to testify to the profitable use of this particular steel.

Innumerable letters like the above prove that HYCC Steel, for intricate Dies and Dies that must meet severe service, is without an equal.

This specially developed chrome alloy steel is as much superior to ordinary Die steels as high speed steel cutting tools are to carbon steel tools.

It tempers uniformly. And its distortion is practically nil. Easily worked, too, with a marked resistance to abrasive action.

You can try HYCC Steel on your next die job with complete assurance that you will triple the Die life—*and greater increases are not uncommon.*

Get full facts in illustrated booklet.

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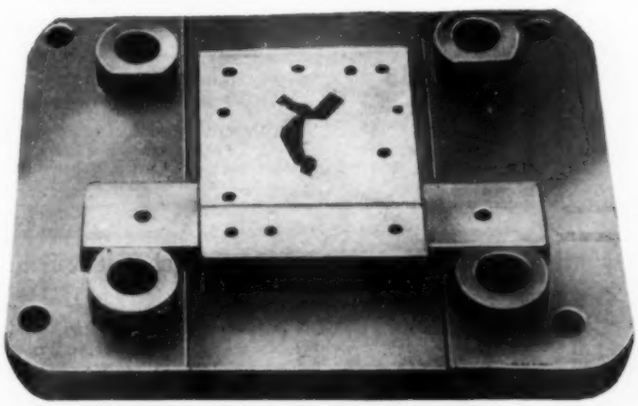
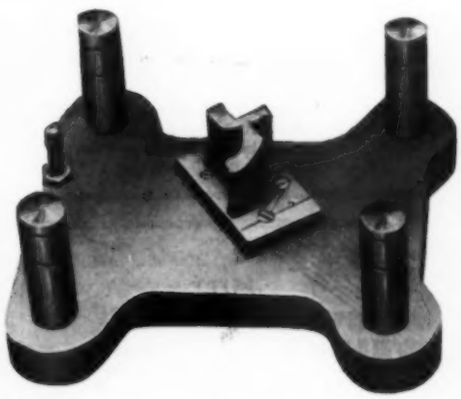
General Offices—17 E. 42nd Street, New York

Branch warehouses and offices in all large cities

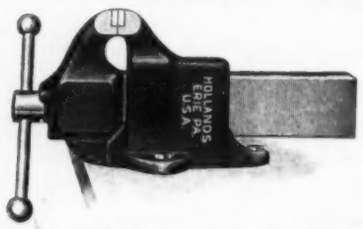
Pittsburgh Syracuse Harrison, N. J. Jersey City McKees Rocks, Pa.

HYCC—*the efficiency steel*





HOLLANDS VISES



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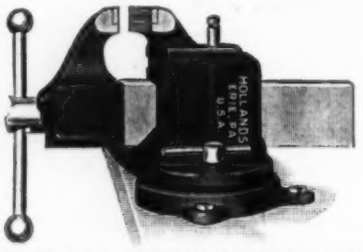
A Line of individuality and merit, that is the result of over forty years of effort to produce Vises that will meet all service demands.



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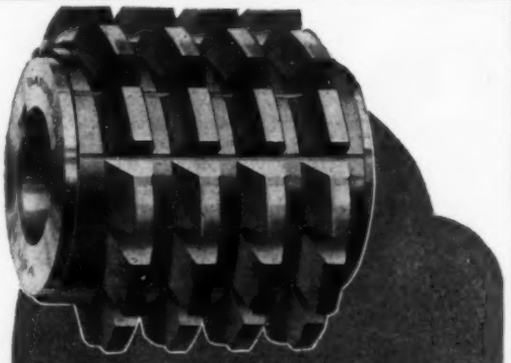
Est. 1887 342-352 E. 18th St., Erie, Pa.



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Cutters
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BARBER-COLMAN COMPANY
General Offices and Plant
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No Recoil!

For one thing, the weight is properly distributed in REED Vises to give absolute rigidity for effective benchwork. Holds the vise job firmly— no recoil or spring.

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Let the *originators* of *Spiraloid* and *Skew (Hypoid)* GEARS with offset AXES solve your GEAR PROBLEMS

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Manufacturers of GEARS and GEAR CUTTING MACHINES

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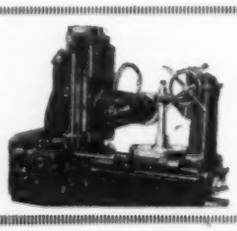

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GEAR HOBBERS
are establishing new standards of gear perfection.
Ask for Catalog No. 926
GEORGE SCHERR CO.
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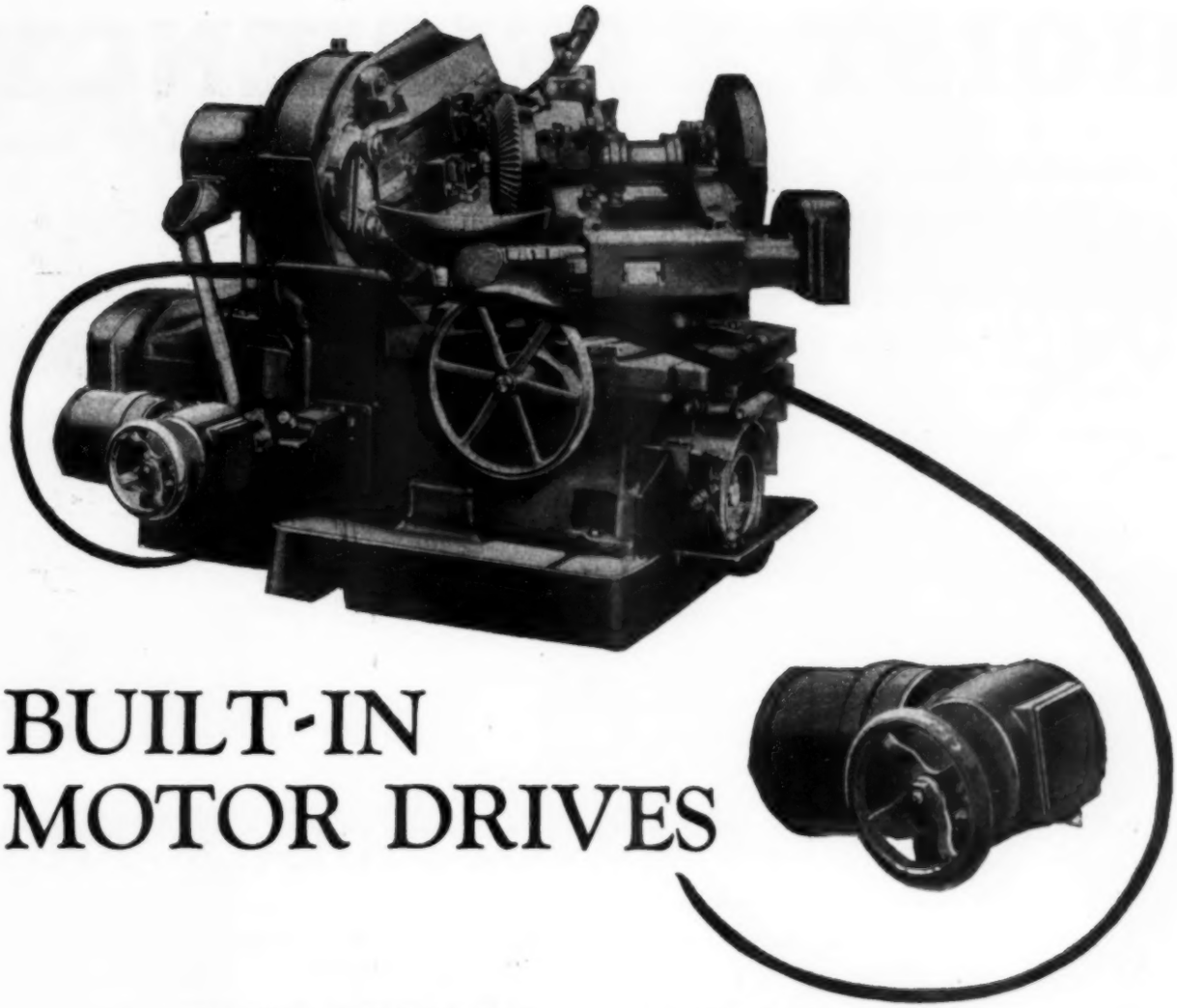

BUILT-IN MOTOR DRIVES

The Gleason Built-in Motor Drive is compact, quiet, efficient.

The load is transmitted and the reduction secured through a pair of Spiral Bevel Gears the pinion of which is mounted directly on the armature shaft of the motor. The entire unit is attached to the machine, assuring proper adjustment at all times.

The accompanying illustration shows a Gleason Built-in Motor Drive on one of our 12 in. Straight Bevel Gear Generators. This unit can be attached to older type Gleason Generators and Planers and, in many instances, on other makes of machines.

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We shall be glad to go into details and give you any desired information.

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HOIST EFFICIENCY

Harrington Hoists are *efficient* because there are 6 types of Hand Chain Hoists up to 20 tons capacity—*which means you get the size and type* you need for *any* lifting job. And there's a powerful and dependable Electric Hoist for routine lifts of 1-ton or less.

Harrington Hoists are smooth running, simple to operate (no confusion between load and hand chain). The load is suspended entirely on steel . . . .

Harrington has been making hoists for half a century, and the many repeat orders received during that time are the best evidence of Harrington Hoist efficiency.

Our descriptive bulletins should interest you when considering the purchase of a new Hoist. Write for them.

THE HARRINGTON CO., PHILADELPHIA

Tirex Portable Cord Lasted Three years on a portable drill

TIREX NEVER KINKS

This is the record made by Tirex on a portable drill, on a portable valve grinder and on a portable drop light in an automobile and truck repair plant.
This company wrote us as follows:
"Tirex Cord outlasted all other kinds of cords that we tried and seems the best suited for our requirements."

This is unusual. So is Tirex. Try it.
Write for sample piece today.

SIMPLEX WIRE & CABLE CO.
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HAVE YOU YOUR COPY of HASKINS CATALOG No. 41?

It contains a lot of useful facts on HASKINS flexible shaft equipments—the modern method of cutting costs and increasing efficiency. Shows you how to save 10% to 50%.
Write for it today.
R. G. HASKINS CO.
4629W. Fulton St.,Chicago
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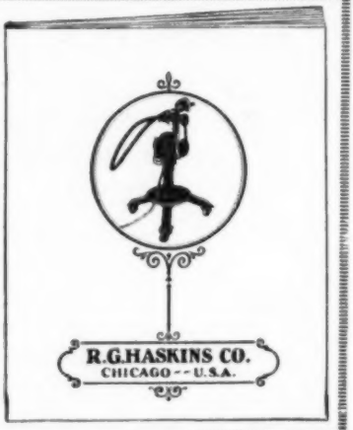

for all types of industrial machinery

The applications of Raybestos run the gamut of Industrial machinery. It serves as a frictional slip clutch on fractional horsepower motors and effectively brakes 50-ton cranes. The essence of more than 20 years' experience is at the call of any manufacturer. Ask us to recommend the right size and type. Catalog upon request.

Silver Edge Raybestos

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DODGE
MISHAWAKA
DODGE MANUFACTURING CORPORATION
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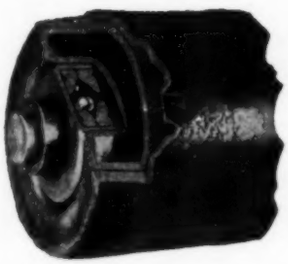
The World's Marketplace for Industrial Equipment

SEND YOUR OVERHEAD CRANE INQUIRIES TO SHEPARD . . . .

Shepard Electric Crane & Hoist Co.
374 Schuyler Ave., Montour Falls, N.Y.

Built-in Service



"Built to Fit the Job"

Our Gravity Roller Conveyor can be furnished with Through Shaft ball bearings for shaft, sizes ranging from 5/16" to 1¼" and with bearing construction in proper proportion.

Where conditions only require a bearing with shaft size of ⅜" we are not compelled to use a ½", and where a 13/16" shaft is required we have it to use and do not have to skimp through with a ¾ inch.

That's the answer

Long service records for Standard Conveyors with freedom from constant maintenance trouble is due to the construction. Because of such construction, users of Standard Conveyor Systems have reduced handling costs over old handling methods more than 75 per cent. In one case there was a 150 per cent production increase per employee as soon as a Standard Conveyor System was installed.

Whether it is belt, slat, or roller conveyors; power or gravity; spiral chutes, piling and tiering machinery; lift elevators or pneumatic tubes, there are Standard features that are the positive assurance of dependable conveyor service with economy.

Our Conveyor Counselors can give you some very interesting conveyor service data.

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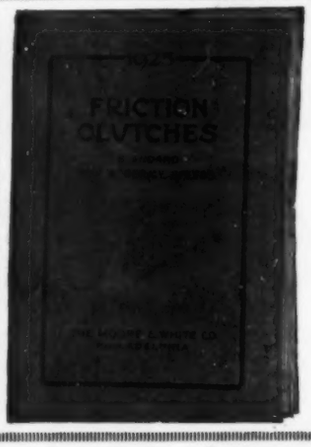

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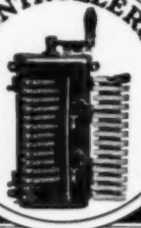

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will keep your plant running smoothly. Write for descriptive literature, list of dealers, and catalog.

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PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS
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Belt or motor driven range ⅛ in. to 18 in. inclusive, also portable machines ⅛ in. to 6 in. inclusive.

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Unusual holding qualities

The well-proportioned body is a single casting made from selected tough steel. It is highly finished all over and the face is ground to a straight edge.

The heat-treated jaws have raised and ground steps. The screws are large diameter with heavy square thread their full length.

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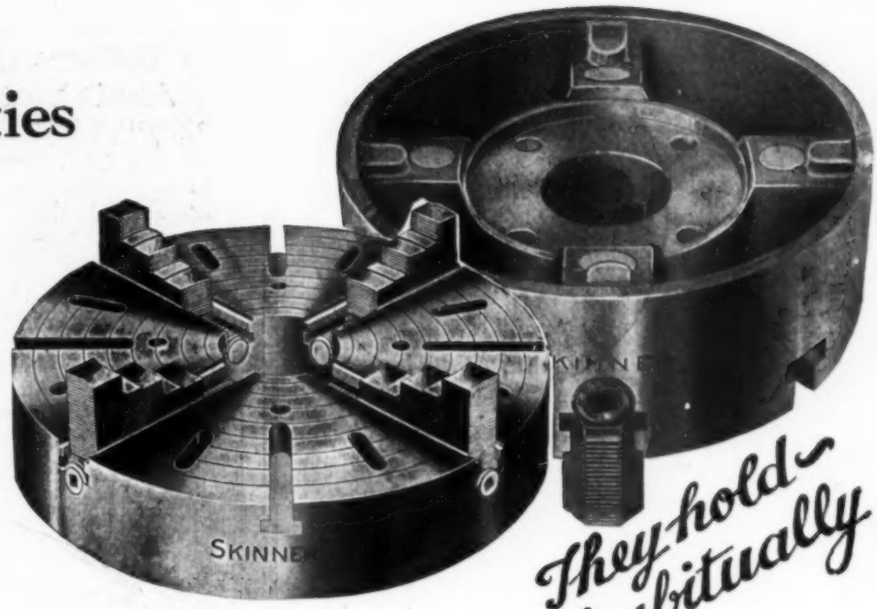
"We have never known a Skinner Steely Body Independent Chuck to break in service."

Send for the Skinner Catalog and note all the details of the No. 1900 Chucks, and its range of sizes.



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All Steel Independent Lathe Chucks

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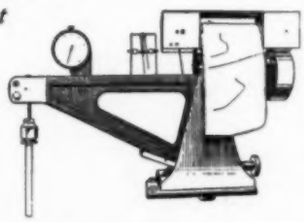

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Only PRODUCTION Registers on a Counter

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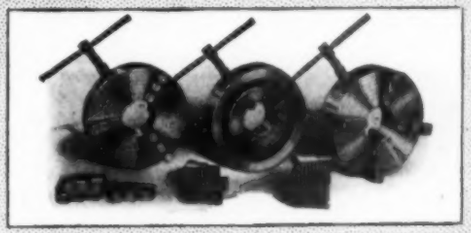

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Light, Medium and Heavy Weights -- Iron or Steel Bodies

Special chucks designed and built to meet your specifications

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Derives ample power from any lamp socket and is easily moved from job to job. Write for new illustrated bulletin.

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NO LEVELING REQUIRED

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puts speed and profit in your angular drilling, milling, planing, shaping and grinding jobs. The work is quickly set-up on the table and but a few seconds are required to locate it at the desired angle. Its applications are practically unlimited and it pays its cost many times over by eliminating the necessity for expensive jigs and fixtures. You need it in your tool room, for variety work and on steady production.

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Quick Change Chucks and Collets,
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Lathe and Drill Chucks

Catalog No. 528 tells all about them—Send for a copy

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ENGRAVING MACHINE

The only GENERAL PURPOSE MACHINE for light and heavy engraving on flat or spherical surfaces that is equipped with new mechanical features for cutting plastic designs in dies and molds, metal, wood, ivory, bakelite or other materials.

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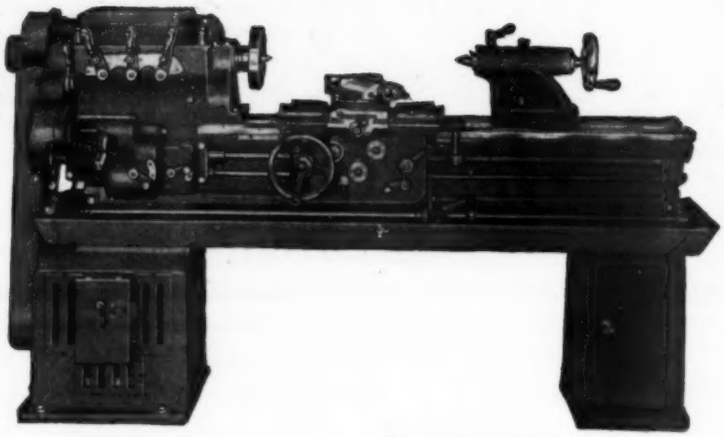
Porter-McLeod Geared Head Lathes



Headstock equipped with chrome nickel heat treated gears. Starting, stopping and reversing in the pulley is done by means of Apron Control.

Double Walled Apron, bronze bushed and so patterned that the gears all run in a bath of oil. Reverse in apron standard equipment.

Gear Box equipped with all steel gears and clutches.

Spindle is chrome nickel steel, forged and bored from the solid.

Porter-McLeod Geared Head lathes are built in 13 and 15-in. swing.

We also manufacture a 14 in., 15 in., 16 in., 19 in., 21 in. and 24 in. swing cone head lathe, either single or double back geared with loose or quick change gear.

Write today for Descriptive Bulletin and Prices.

Porter-McLeod Machine Tool Co., *for 42 years Makers of Fine Lathes* Hatfield, Mass.

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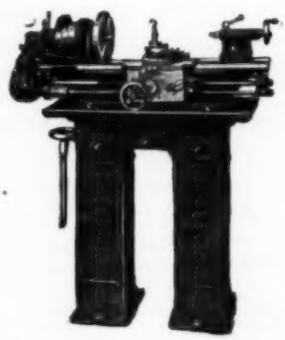
Dalton Bench Lathes are built in sizes from 7 x 30 inches to 9 in. x 4 ft. May be arranged for motor drive and equipped with special attachments.



Dalton Lathe with Full Cabinet Mounting and also furnished with semi-cabinet, plain floor mounting or foot power stand.

Rather than tie up large lathes with small odd lot jobs, many progressive plants find Dalton Lathes are just what they need to round out their equipment lists.

These efficient, low cost lathes are adapted to an almost endless variety of work.

Fitted with special attachments, Dalton Lathes approach the single purpose unit in economy and productive results.

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8 West 40th Street, New York, N. Y.

"Small Lathes for Big Jobs"

The New Rivett Utility 8-in. x 38-in. Bench Lathe

$225.00

Rivett Utility Bench Lathe No. 507

consisting of bed, headstock, tailstock, compound slide rest, clamping bolt, driving plate, center and center chuck, screw draw-in spindle, countershaft and three treadles	$225.00
2 Supports for countershaft plank	12.00
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Set of Belts	16.00
Set of 12 collets 1/16-in. to ¾-in. by 16th	35.00
Total Price, Outfit as illustrated except less woodwork motor and vise	**$340.85**

"If it's Rivett it's right."

New complete catalog and hand book No. 507-A on request.

Rivett Lathe & Grinder Corporation
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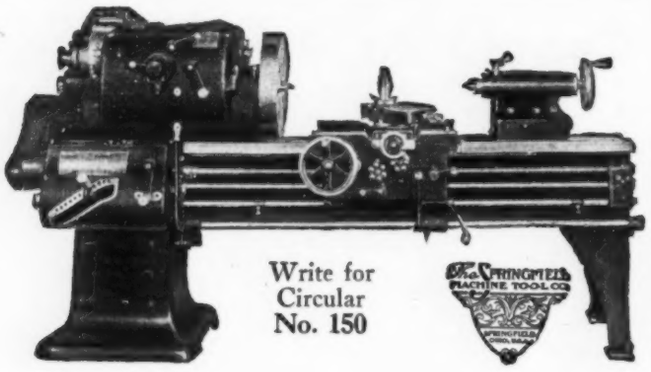

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earn more because they produce more

Users of Springfield Lathes know that the many advantageous features of these tools add considerably to their daily margins of profit.

Some of these improved features include: double friction type countershaft with self-oiling bearings; carriage with wide bridge and gibbed full length in back; felt oil wipers to protect the bed; friction clutch and brake.

For others see Circular No. 150.

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This precision bench lathe handles light and medium jobs of turning, drilling, screw cutting, milling, etc. It's a versatile unit that will cut production costs because it is never idle.

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For Precision

Tool and instrument makers—the most critical class of machinists in the trade—for 65 years have been using Stark Lathes with satisfaction.

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Established 1862 — Originators of American Bench Lathe

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The design incorporates the most advanced principles of modern machine tool practice—backed by over fifty years' experience as specialists in this field.

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Model R—Automatic Lo-swing when it comes to turning.

Send us your blueprints for production cost estimate.

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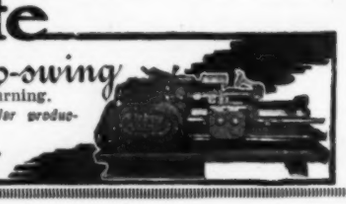

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Manufacturers of Grinders, Buffers, Speed Lathes and Manual Training Lathes.
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Motor or Belt Driven—*A Good Machine at a Low Price*

Exceptionally heavy and rigid in construction. Saws fast and straight. Stops automatically on completion of cut. Has adjustable stroke 4 in. to 6½ in. Simple dependable action. Equipped with quick action vise that saves chucking time. Ask for catalog.

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6"x6" long stroke.
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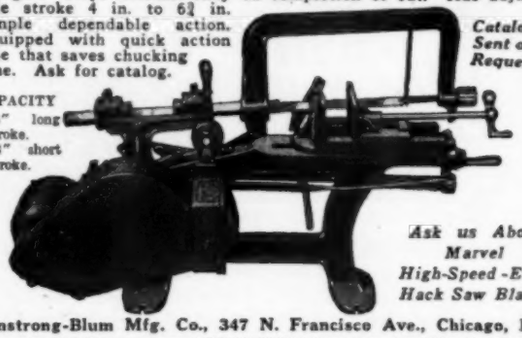

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Send for this free booklet—

If you saw metal, you'll be vitally interested in this booklet. It describes the New Peerless Universal Metal Saws that cut faster than ordinary power saws with Milling Cutter accuracy, and at the same time doubling the life of the blade.

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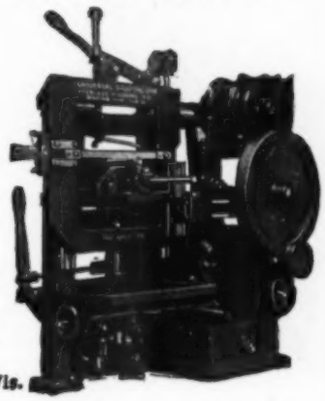
Peerless U. S. A. Power Blades have some exceptional production records back of them. Try out a dozen. Also makers of Peerless Duplex Hand Blades, and Peerless Gauging Drill Racks.



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Metal Sawing Machines

Modern Equipment Cuts Costs

Set these packs of Lenox Wolves on the trail of your toughest jobs!

Thousands of shops the country over—shops whose work demands of hack saw blades the very finest quality that money can buy—have turned to these packs of rangy, rugged, super-strong Wolves of Lenox.

If you are looking for long-lasting, keen edges—for blades that cost less because they cut more, just ask for "The Tools in the Plaid Box"

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A product by the makers of the famous wolves of Lenox-hack saw blades. Send for a copy of "The story of the Wolves of Lenox."

MILFORD— the all-hard TUNGSTEN STEEL blade for power sawing—quality built for more than forty-three years.

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THE ACME MACHINERY COMPANY
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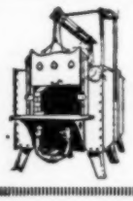

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A Portable Metal Saw

The Racine Junior 4-in. capacity, portable, electric power saw is a highly efficient tool for shops and tool rooms. The Racine line of metal cutting equipment includes machines up to 12-in. capacity. Free metal cutting chart and full information on request. Write.

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AMERICAN GAS FURNACE CO. — PIONEERS IN 1913 — LEADERS TODAY

Forges, Blowpipes, Gas Blast Burners, Furnaces and Heat Treating Machines for every industrial purpose.

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Heat-Treating—Soldering—Metal Melting

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Developed for Washing and Drying screws and screw machine products not too large to lend themselves readily to balancing in a rapidly revolving basket. Any number of separate inlets may be provided for washing solution, cold and hot water if required.

Should hot air be required to expedite the drying the electrically heated Cyclone Dryer grid is interchangeable.

We make a complete line of Centrifugals for extracting oil from chips and metal parts, also for washing and drying small parts. *Send for Bulletins.*

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will solve your cleaning problem!

Service Men Everywhere

Oakite is manufactured only by
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A size and style for every purpose

Simplicity, low cost and fitness for the particular oiling condition characterize these popular Bennett Oil Cups.

Made in sheet steel and brass. Write for Catalog and samples.

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HANDY-TOP OIL CUPS

GITS BROS.

Better Oilers

287 *Styles & Sizes*

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Complete New Line of
Die Sinking and Engraving Machines

offer many types and sizes—Accurate and Durable—over 1000 in use.—Also

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of entirely NEW design. Novel construction and patented features permit *larger* capacity—easier operation and greater accuracy. Ask about the GORTON 8-D Vertical Miller.

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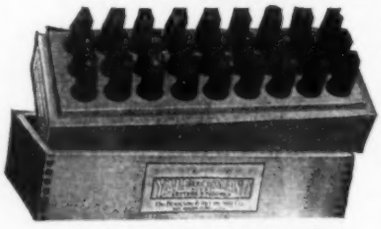
GEORGE GORTON MACHINE CO.
Racine, Wisconsin

YALE HAND CUT STEEL BRAND
LETTERS & FIGURES



Showing handy set of Yale Brand Steel *Hand cut* figures.

YALE BRAND LETTERS and FIGURES give sharper impressions—because hand cut..

They last longer because we use high grade tool steel tempered by our own special process.

All sizes from 1/64-in. to 1-in.

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THE HOGGSON & PETTIS MFG. CO.
New Haven, Conn.

Sizes from ⅜ in. to 6 in. Carried in Stock

You don't need a special wrench *for* Protected Lathe Dogs

Just a standard open end or socket wrench "does the trick."

All sizes and styles carried in stock.

Write for prices

THE WEST STEEL CASTING CO.
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TUCKER OIL HOLE COVERS

Made in a variety of styles and many sizes to suit all needs. Send for descriptive catalog 10 and price list.

W. W. & C. F. Tucker, Inc.
610 Capitol Ave.,
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Style C.

Style D.

Also Hand Shears

Style E.

and Rod Cutters

Style G.

Style A.

COLT AUTOSAN

METAL PARTS WASHING AND DRYING MACHINES
See advertisements in the 1st and 3rd issues of the month—or write for illustrated bulletin A-15.
COLT'S PATENT FIRE ARMS MFG. CO., HARTFORD, CONN.

A Post Card that Saved Dollars for a Machinery Builder

Saved Dollars for his Customer too.

"Stop using No. 3. Refer to our lubrication instructions." It was a telegram a few weeks ago from the engineering offices of a machinery company to a customer seven hundred miles away.

Not that there is anything wrong about No. 3 cup grease. It is used in thousands of plants and is often just the right thing. But a letter which followed the telegram explained that on this particular machine No. 3 is too hard. For that reason it would almost surely cause bearing troubles within a short time.

How It Happened

Here's how it happened that this machinery firm knew that a new customer seven hundred miles away was using the wrong type of lubricant, also how the engineering department was able to forestall a machinery failure before it had the chance to occur.

Along with more than 600 other machinery companies this firm installs the Alemite high pressure lubrication system on its products as standard equipment. Immediately when its machines go into service the nearest Alemite representative calls upon the buyer to make certain that the lubrication system is properly used.

Here's what happened in this case. The machinery manufacturer sent a form post card to the Alemite Manufacturing Corporation in Chicago. The card was relayed to one of the Alemite branch offices south of the Mason-Dixon line. The local Alemite representative added a final touch to the machinery manufacturer's sale by making a courteous service call. A report was sent back to the machinery manufacturer. And that's how he was able to forestall the use of the wrong kind of lubricant before trouble occurred.

This simple Alemite service now given at no cost to all makers of Alemite-equipped products may have saved the manufacturer a profit-robbing service expense. Beyond doubt it saved the customer a shutdown loss and labor of replacing several bearings. This is one of the reasons why careful machinery buyers are now specifying Alemite lubrication on new units that they purchase.

On Old Machinery

Alemite lubrication is now standard equipment of more than 600 makes of industrial machinery including textile machines, conveying units and locomotives.

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☐ The Story of Barrel to Bearing.
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Automatic Chucking Machines

A RUGGED Four Spindle Automatic Chucking Machine — for chucking work up to 11-in. dia. x 10-in. long. Each spindle independently adjusted for highest efficiency. Positive lead screw threading, micrometer adjustment of the work turret, etc., contribute distinctive operating benefits. *No bothersome cams to cut! Fully described in illustrated catalog.* Production estimates cheerfully furnished.

Goss & DE Leeuw Mach. Co.
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A quick start and a quick finish!

The quicker the "get away" on a job, the sooner will the work be finished. That's the reason why such high output figures have been obtained on the

GIANT Keyseater

Set up time is almost negligible. Simply slip the work over the grooved tool part. It is chucked positively and accurately by the bore only, while the down pull of the cutter bar prevents slipping and chatter. **GIANT** Keyseaters are made to hold to limits of accuracy as close as .001 inch. They can be operated easily by an unskilled hand.

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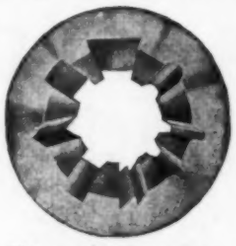

This sample was cut in 40 mins. including set up.

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Double End Centering Machine

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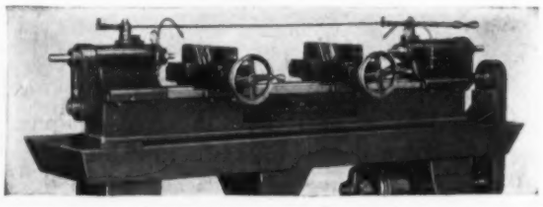

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"Saves an average of 50%"
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For milling the largest threads on a production basis.

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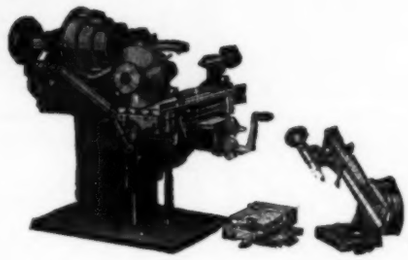

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Cataract Bench Millers are made in both horizontal and vertical types. Table feed is automatic, with travel of 5½ inches. All feed screws are provided with independent steel indexes with garduations of .001.

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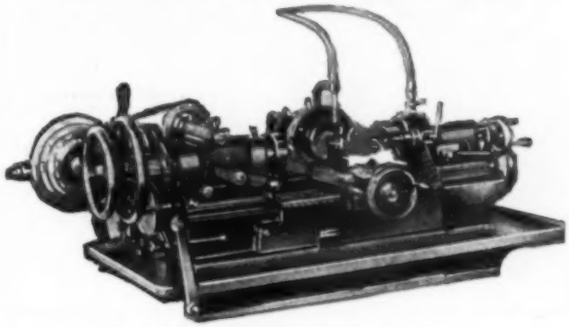
WALTHAM SEMI-AUTOMATIC
THREAD MILLERS



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Waltham Semi-Automatic Thread Millers were specifically designed for just that.

That they are keeping production costs on small threaded parts down to rockbottom is proved by some of the records they have established and maintained on all sorts of work within their range.

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If your cam requirements do not warrant the purchase of one, you practically own a Rowbottom Universal Cam Milling Machine when you give our contract department the order to make your cams.

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SPLINE MILLERS
for closed end keyways and through slots.

VERTICAL MILLERS
with circular, contour, spiral and continuous milling attachments.

DRILLING MACHINES
1 to 7 spindles, hand, power and simultaneous feed. Heads, adjustable for variable distances between spindles.

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Uniform blow, foot or power.

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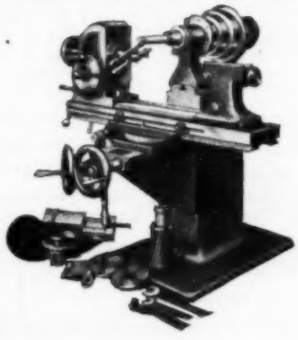

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Don't make the mistake of using big, expensive milling machines on light jobs, where the U. S. Improved Hand and Weight Feed Milling Machine will give you greater and better production at infinitely lower cost.

Don't! It isn't logical. Bulletins on request.

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Hand and Weight Feed
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The United States Machine Tool Company
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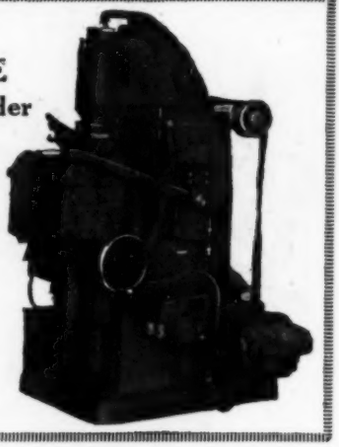

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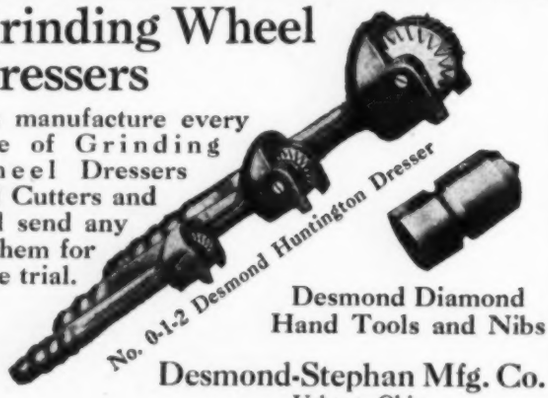

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for grinding sides of rings

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for pistons, guides, short shafts, etc.

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are set with carefully selected Diamonds of the Best Quality. Security of the Special Setting Guaranteed. The name "Dickinson" is stamped on all tools. We are proud of a long record of satisfactory service.

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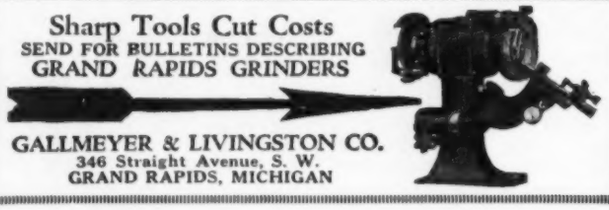

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KNEE TYPE—RING WHEEL
for Flat Surfaces
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for Emery Rings, 10 in. to 30 in.

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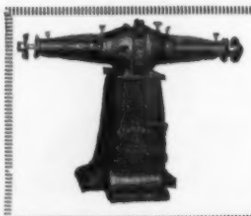

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Drills, Center Grinder, Hand Grinders. Made in sizes from ¼ hp. to 15 hp.

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Either Horizontal or Vertical Spindle Type

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Get our bulletin for particulars.

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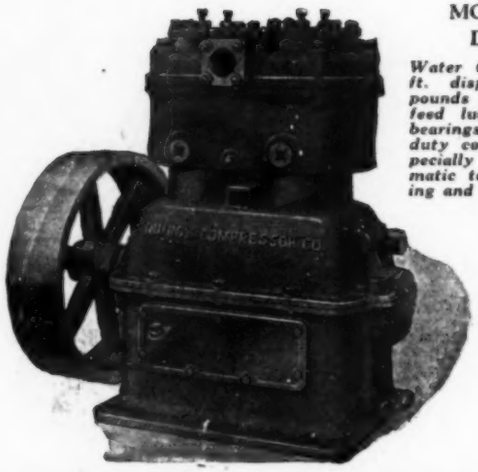

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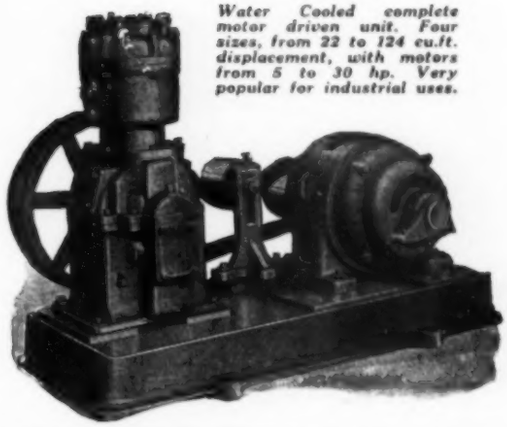
DUPLEX

Water Cooled; 124 cu. ft. displacement. 150 pounds pressure. Force feed lubrication to all bearings. This heavy duty compressor is especially suited to pneumatic tool work, washing and sand blasting.

MODEL W-D

Water Cooled complete motor driven unit. Four sizes, from 22 to 124 cu.ft. displacement, with motors from 5 to 30 hp. Very popular for industrial uses.



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You know that compressed air is the most economical and flexible power you can use for many purposes—air cleaning, paint spraying, pumping liquids, sand blasting, operating air lifts and hoists.

But do you know that the most economical and *efficient* source of compressed air is a Quincy Compressor?

The unusually high character of Quincy Compressors results from these two important factors:

1st — They are designed by our own engineers.

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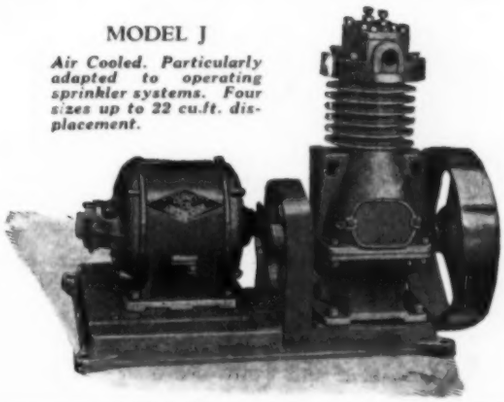
Air Cooled. Particularly adapted to operating sprinkler systems. Four sizes up to 22 cu.ft. displacement.



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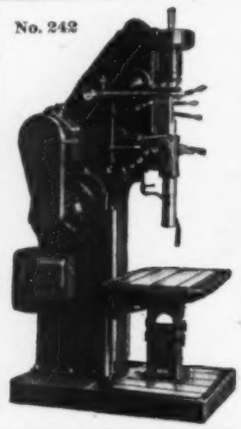

Unequalled

Nothing like this Barnes Drill Co. No. 242 has ever been seen before. The result of 20 years of experience in building superior drills, it is a super-production tool that more than fulfills the exacting requirements of today. Self-Oiling. All-Geared. Roller and Ball-Bearings. It will be worth while to investigate.

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When a prominent automobile concern wanted to cut production costs, they ordered a

U. S. MULTIPLE DRILL HEAD

This particular head drills 12 holes at a time. But we make any type to suit any particular need.

Let us know your particular problem.

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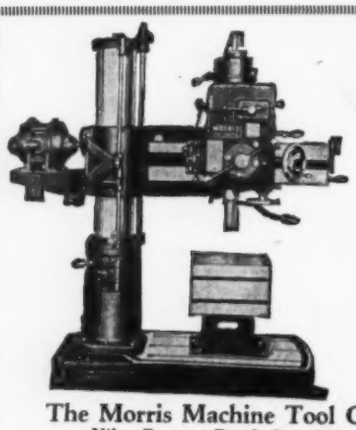

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It's not surprising that Morris Radials are effecting big economies wherever they are installed when one considers their construction.

Helical spindle gears of small diameter insure a constant power factor at the cutting edge of the tool. This eliminates any tendency toward chatter and insures a smooth, powerful drive.

This is only one typical feature—details of all gladly sent on request.

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VERTICAL SEMI-AUTOMATIC DRILLING MACHINES

are best for general purpose production on small hole drilling jobs. The work is clamped automatically and can be burred automatically if desired. The spindle is advanced under a resilient pressure feed with friction control which varies the rate of penetration automatically to meet the variable conditions encountered as though under human control. The result is an extra high drilling speed with a big saving in drill breakage.

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For Close Accuracy, and Large Production

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Pioneers in Better Drilling Methods

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Semi-Automatic
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Five spindles, cam control, 0 to ⅝ in. drills. Fast, accurate, reduces small hole drilling costs. Investigate.

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MULTIPLE SPINDLE DRILLERS

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NOW... for immediate delivery... the NEW MODEL K Demco

6 DEMCO FEATURES

1. A spindle that automatically compensates for its own wear.
2. No lost motion in spindle.
3. No spindle adjustments.
4. Automatic belt tension idler.
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6. Conversion to motor drive by removing gear box drive and substituting motor.

Model K

THE DRILL SPINDLE THAT AUTOMATICALLY ABSORBS ITS OWN WEAR

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DIVISION OF

MERIT EQUIPMENT CORP.

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The New DEMCO

Embraces NEW FEATURES *in Sensitive Drilling Machines that* CHALLENGE COMPARISON *Everywhere*

THE development of the new Demco Model K represents the latest engineering achievement in Sensitive Drilling Machines, built around the Demco Patented Spindle, the only Spindle on the market guaranteed to *automatically compensate for its own wear,*—the Spindle that has *no lost motion* and requires *no adjustment.*

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Belt or Motor Drive
1 to 6 Spindles
Hand or Automatic Power Feed

Compare These Features With Any and All Sensitive Drilling Machines:

¶ All revolving parts are carefully balanced and are equipped with ball bearings.
¶ Flat endless belt from spindle to drive shaft cone.
¶ Automatic belt tension idler; tension is adjustable.
¶ Independent belt tension; can be operated by hand.
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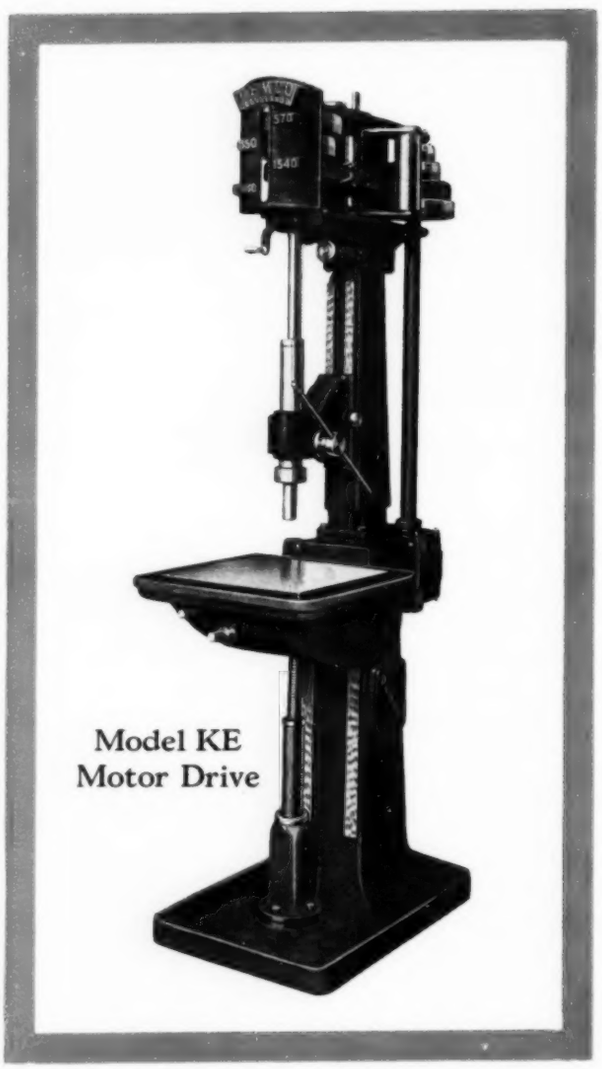
¶ Gear box forms a complete unit—can be removed and vertical motor substituted.



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Motor Drive

¶ Weight has been distributed to insure practically no vibration.
¶ In other words, the last word in Sensitive Drilling Machine design, embodying every modern improvement, guaranteeing Demco accuracy in high speed production drilling.

Demco dealers in all principal cities in the United States and Canada.

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Division of MERIT EQUIPMENT CORP.

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—Fast—
on the job

—Simple—
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—Complete—
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Ready for the Job
with nothing to buy

Spindle Speed 400—850—1750 R.P.M. Capacity up to ½ in. with motor, cord, belt, round and square table supplied.

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Complete Stock Carried at Branches.

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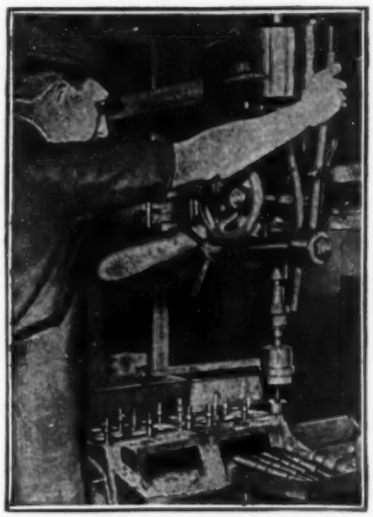

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Style E. P.

This automobile crank case has 24 holes tapped and studded.

5 holes ⅜ in. x 16 in.; 12 holes ¼ in. x 13 in.; 6 holes ¼ in. x 20 in. and 1—⅛ in. hole for pipe tap.

These holes are tapped in *4 minutes;* and the 24 studs are set in *3 minutes,* with a total of 64 crank cases handled per each nine-hour day.

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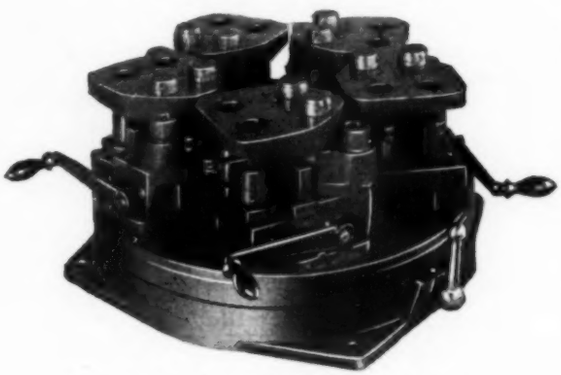

Multiple drilling operation using the Siewek Rapid Drill Jigs.

Let us engineer your drilling problems the Siewek way.

Some desirable territory still open for representatives.

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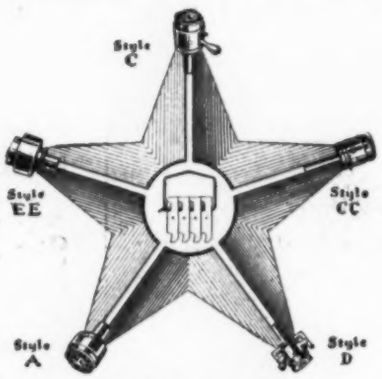

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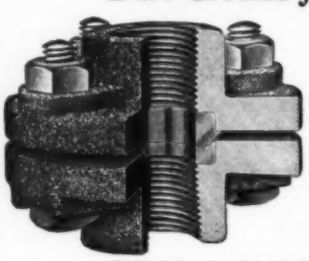

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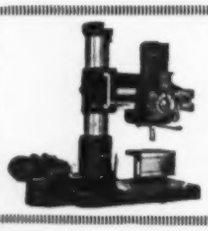

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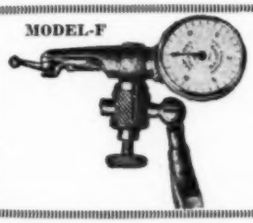

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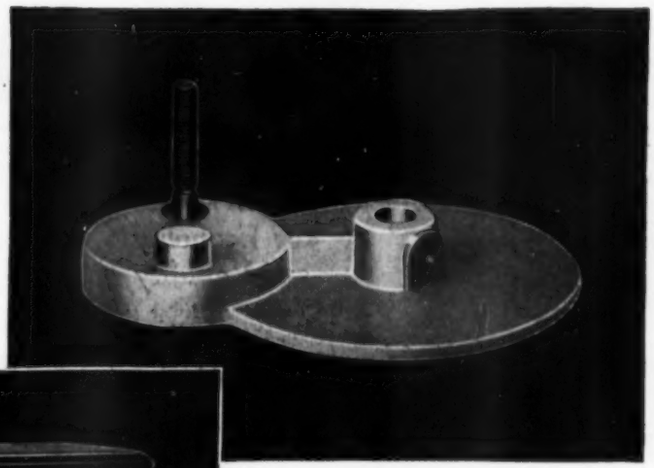

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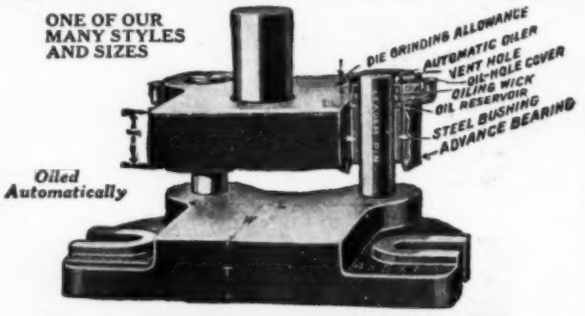

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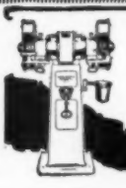

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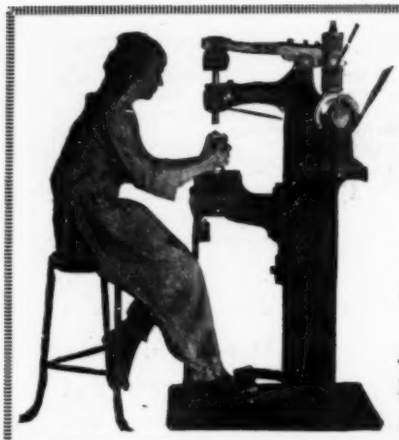

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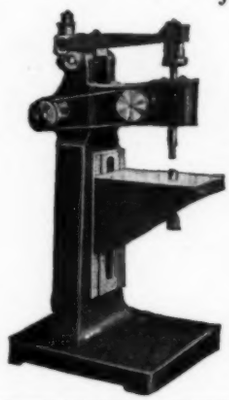

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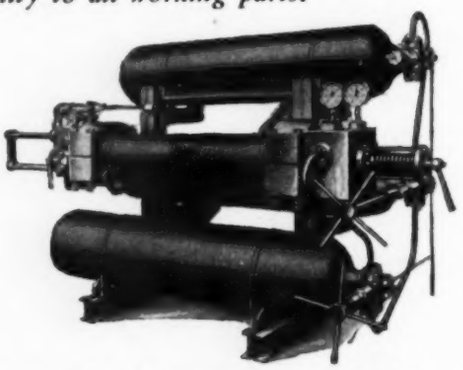

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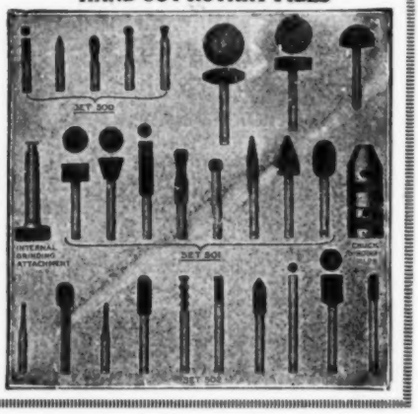

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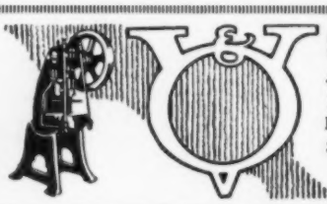

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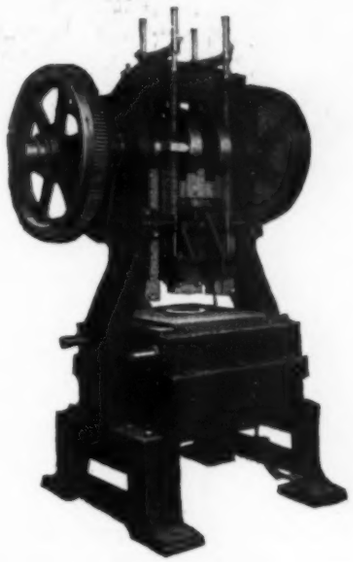

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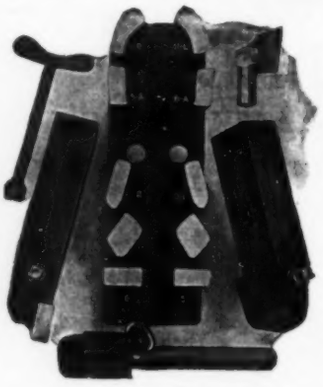

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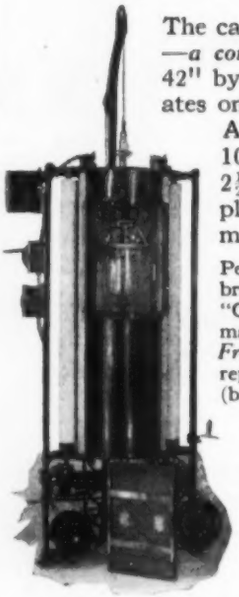
3 FEET A MINUTE!

630 Sq. Ft. per Hour



The capacity of the Shaw Vertical —*a continuous blue printer*, prints 42" by any desired length. Operates on 110 or 220 volt, D. C. or A. C., 60 cycle at cost of 10c to 18c. per hour. Compact 2½ foot floor space, can be placed right where it is needed most.

Perfect Blue Prints, blue line and brown line prints, negatives and "OZALID TYPE" prints can be made with this printer. *Photo Frame*, size 10" x 15", ideal for reproductions from photo negatives (both film or glass).

The Shaw Continuous Vertical Blue Print Machine

SHAW BLUE PRINT MACH. CO., Inc.
9-11 Campbell St. Newark, N. J.
EST. 1903 INC. 1910

S. S. White Flexible Shaft Tools

For Grinding, Burring, Drilling, Assembling, etc.

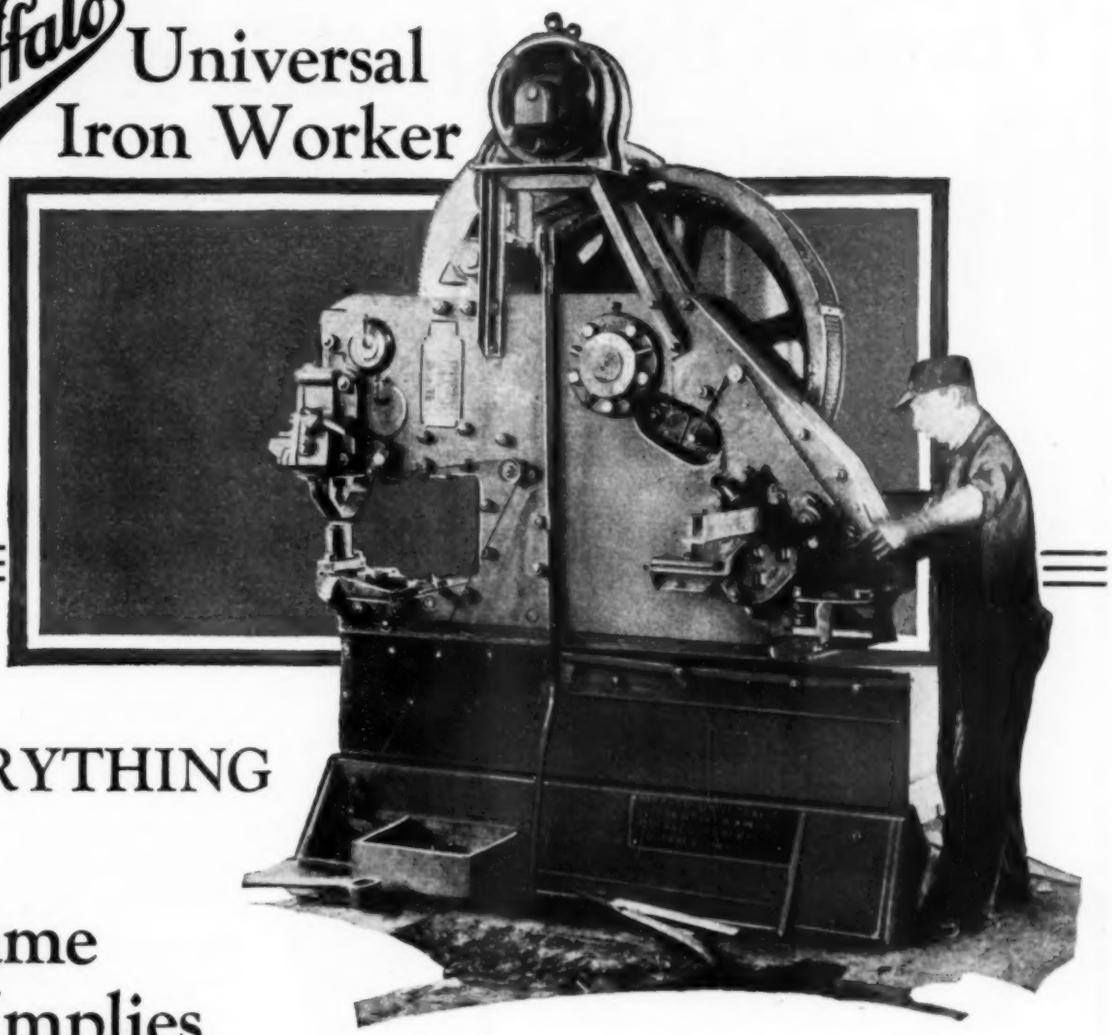
Or for that matter on any work where portability and handiness are desirable features.

Put S. S. White Flexible Shaft Tools where they are accessible to your high priced skilled mechanics and see for yourself how they will turn out more and better work at considerably lower output costs.

Our illustrated catalog shows dozens of uses in all classes of work. *May we send it?*

The S. S. White Dental Mfg. Co.
Industrial Division
152 W. 42nd St., New York, N. Y.

"Buffalo" Universal Iron Worker



EVERYTHING The Name Implies

One of the well known steel working companies (name on request) has found the *Buffalo Universal Iron Worker* to be an almost indispensable part of the shop equipment even though it has been in use only 8 months. This company reports that the *Buffalo Universal Iron Worker* handles with unquestionable satisfaction any size of sheet or bar stock within its range, and is being used chiefly to make channels and cut angles for cranes and refrigerating machine frame units.

Not only does the Buffalo Universal Iron Worker combine several machines in one: punch bar cutter, shears, and bender, but it requires no special tools, saves an appreciable amount in cutting set up time to a minimum, and "is *always* ready" to go to work.

Whether you have a small or large shop there is a *Buffalo Machine* that will fit your production needs and save you money.

Let us know the type of stock you want handled and we will send you descriptive literature on the Buffalo Universal Iron Worker that will fit your needs.

Buffalo Forge Company, 448 Broadway, Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

The MORSE

Forged Type High Speed Drill

increased production 53% in one plant.

An average of 300 holes per grind was maintained.

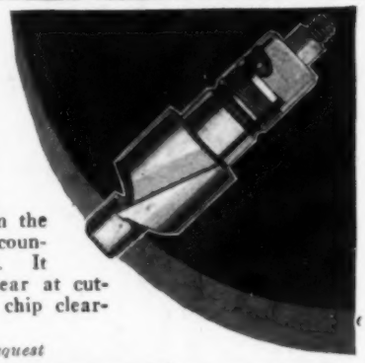
Showing a drill that stays good to the last inch.

It will pay you to Investigate

MORSE
TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS., U.S.A.

MORSE High Speed and Carbon Drills, Cutters, Reamers, Taps and Dies Sold by Reliable Dealers Everywhere

TWO-LIPPED HOGGING CUTTER



This specially designed tool (which will fit any standard Eclipse holder) will cut through hard or sandy scale instantly, that would turn the edges of the ordinary counterbore or spot facer. It features a generous shear at cutting points and ample chip clearance.

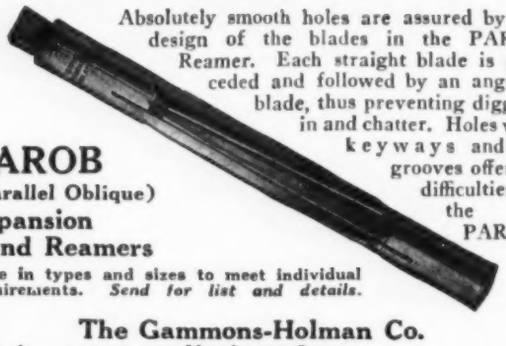
Catalogue Upon Request

ECLIPSE INTERCHANGEABLE COUNTERBORE **COMPANY**
DETROIT ~ MICHIGAN

THE expanding mandrel is practically an internal job. Just as important in the economical operation of a shop as a lathe chuck. Better order a few sizes. They are made in various sizes, taking all bores from ½ in. to 7 in. inclusive.

W. H. NICHOLSON & COMPANY
114 Oregon St., Wilkes-Barre, Pa.

Mechanically Correct



Absolutely smooth holes are assured by the design of the blades in the PAROB Reamer. Each straight blade is preceded and followed by an angular blade, thus preventing digging in and chatter. Holes with keyways and oil grooves offer no difficulties to the PAROB.

PAROB
(Parallel Oblique)
Expansion Hand Reamers

come in types and sizes to meet individual requirements. *Send for list and details.*

The Gammons-Holman Co.
Dept. A Manchester, Conn.

Acme Drill Bushings

Leader Pin Bushings
Leader Pins
Expansion Laps
Hardened and Ground Dowel Pins

Send for Data Sheets and Price List.

Acme Industrial Co., 417 N. Carpenter St., Chicago
173 Lafayette St., New York

X-L-O DRILL JIG BUSHINGS

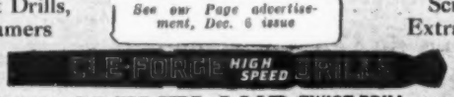
75% of the X-L-O Drill Jig Bushings sold are priced at 60 cents or less! 2534 standard styles and sizes in stock for immediate shipment. Catalog, data sheets and price list upon request.

EX-CELL-O TOOL & MFG. CO.
1467 East Grand Blvd. Detroit, Michigan

Twist Drills, Reamers

See our Page advertisement, Dec. 6 issue

Screw Extractors



The CLEVELAND TWIST DRILL COMPANY CLEVELAND

Use ARMSTRONG Tool Holders

Save
All Forging
70% Grinding
90% Tool Steel

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago, U. S. A.

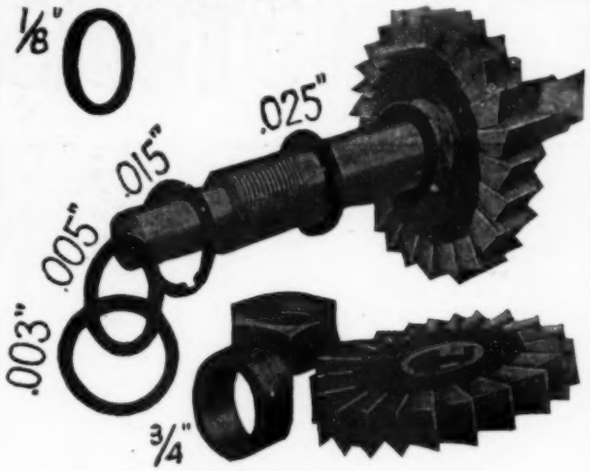
Expansion Boring Tools, Cutters, Reamers and Special Design Tools

Davis Expansion Boring Tools and Reamers are made from the very best materials. They are guaranteed production tools of the highest quality. They will increase production and reduce cost. A full page ad appears in this journal the first week of each month.

DAVIS BORING TOOL CO., Inc., Div. Larkin Packer Co.
6200 Maple Ave. St. Louis, Mo.

TWIST DRILLS, CUTTERS, REAMERS AND SPECIAL TOOLS

NATIONAL
TWIST DRILL & TOOL CO.
DETROIT, U.S.A.



Steel Spacing Washers

ARBOR SIZES						STOCK THICKNESSES				
⅜	¾	1⅛	1½	1⅞	2½	.001	.005	.010	.025	.093
½	⅞	1¼	1⅝	2	3	.002	.006	.012	.032	.125
⅝	1	1⅜	1¾	2¼	3½	.003	.007	.015	.047	
and 4 inches and larger.						.004	.008	.020	.063	

Send today for samples of the sizes you use most. Stock thicknesses for arbors of various diameters are carried in stock, ready for shipment, as shown.

Spacers thicker than ⅛ in. are turned from bar or tubing but not carried in stock.

Prices and samples on request.

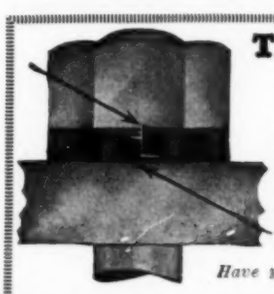
DETROIT STAMPING COMPANY
3445-3459 West Fort St., Detroit, Mich.

THE use of American Swiss Files of Precision by discriminating mechanics for over 29 years is conclusive proof of the uniformly high quality of American Swiss Files.

A separate department has now been developed for the manufacture of American Swiss Knurls and Hand Tools. You will find the same results and savings obtainable in their use as you have found in the use of American Swiss Files. Write for file, knurl and tool catalogs. American Swiss File & Tool Co., 410-416 Trumbull St., Elizabeth, N. J.

ONLY THE BEST

American Swiss
Files...Knurls...Tools



Twice the Holding Power

secured by using Genuine "Keystone" Positive Type Lock Washers. The barbs on the ends dig into both nut and seating member. The greater the vibration the deeper the barbs dig, insuring permanency to bolted assemblies.

Have you our Catalog? Samples on Request.

The Positive Lock Washer Co.
Newark **New Jersey**

CHICAGO, ILL.—Theo. Geissmann & Co.
SAN FRANCISCO, CAL.—Maydwell & Hartzell, Inc.
BOSTON, MASS.—C. J. Swanholm, 863 Boylston St.

GENUINE KEYSTONE LOCK WASHERS

For Nearly FORTY YEARS—LOCK WASHERS Exclusively

A Radical Improvement In Files!

Why do files dull so quickly . . . why do they glaze over . . . why do they clog up so easily? The answer is simple. The fine wire edge gets burned in heat-treatment—the carbon is removed—it crumbles off on the first stroke of work. RED TANGS are *sharpened after hardening.* That gives them a strong, sturdy milling cutter edge that produces 50% more work. *And they cost no more!*

Order a trial dozen and test them on your own work

ARION STEEL CO.
85 Purchase St., Boston, Mass.

RED TANG FILES

—Standardize your threads—
by using one make of threading tools

MURCHEY

Self-Opening Dies and Collapsible Taps
101 Varieties—All Adjustable—Write for Catalog

MURCHEY MACHINE & TOOL CO.
953 Porter St., Detroit, Mich., U. S. A.

TAPS AND DIES

HIGH SPEED and
ALLOY STEEL TAPS
GROUND
THREAD
TAPS

WINTER BROS. CO.
—Factory—
WRENTHAM, MASS.

Stores at BUFFALO, DETROIT, CLEVELAND, CHICAGO, PITTSBURGH

DIES TAPS

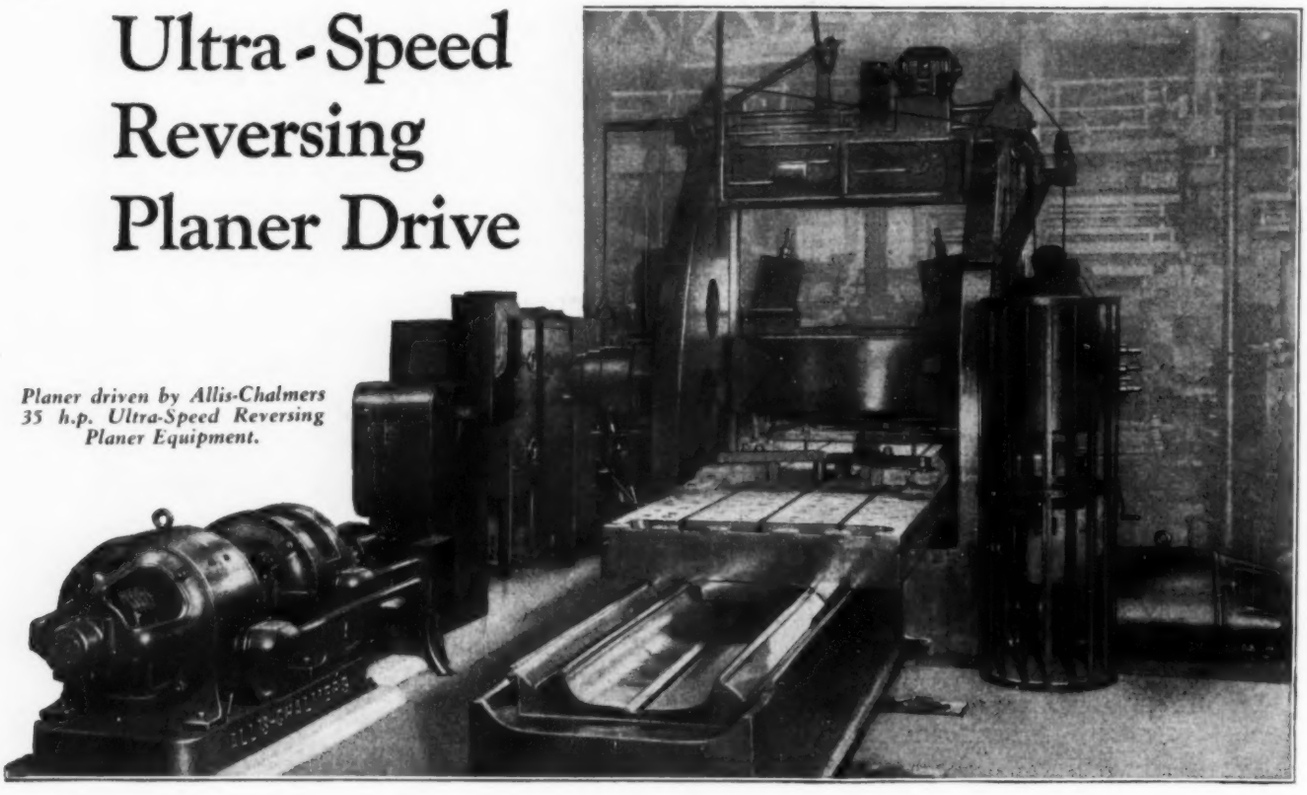
GEO MET RIC

Right from the Lead

THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN.

ALLIS-CHALMERS MOTORS

Ultra-Speed Reversing Planer Drive



Planer driven by Allis-Chalmers 35 h.p. Ultra-Speed Reversing Planer Equipment.

its wide range of cutting and return speeds permits a wide diversity of planer jobs— meaning greater production and more profits

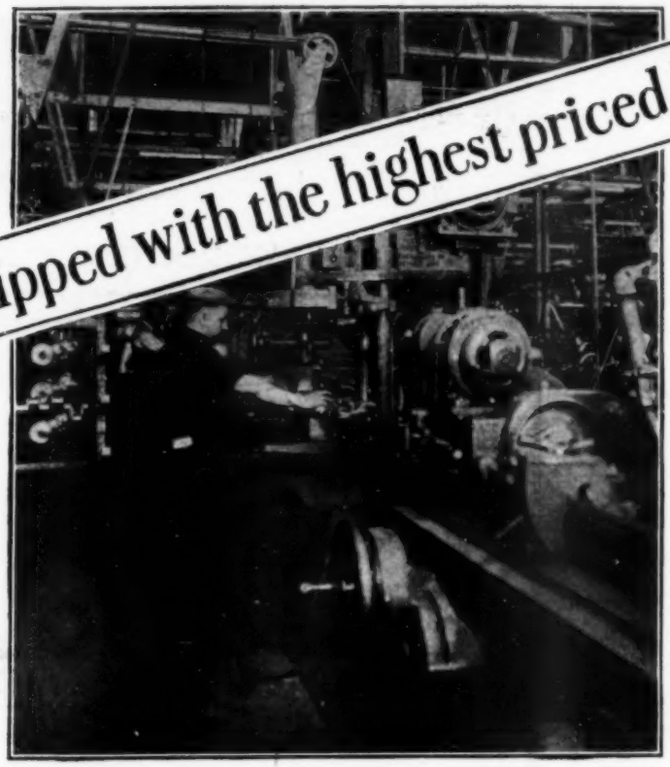
This user says: "We are very pleased with Allis-Chalmers Ultra-Speed Planer Drive as we can make an instantaneous speed change from 8 feet cutting to 150 feet per minute return which, of course, is the most valuable feature on a modern up-to-date planer drive as far as economical operation is concerned."

In any type, in any service, Allis Chalmers motors have piled up authoritative figures which closely predict the savings they can make for you.

ALLIS-CHALMERS MANUFACTURING COMPANY
MILWAUKEE • • • • WISCONSIN
District Sales Offices in all Principal Cities

ANOTHER ONE OF THE 143 MACHINE TOOL MANUFACTURERS THAT USES SKF BEARINGS

General Manufacturing Co.



Equipped with the highest priced bearing in the world

YOU MAY BUY A BEARING AS A BARGAIN BUT TRY AND GET A BARGAIN OUT OF USING IT

for

Nothing is apt to cost so much as a bearing that cost so little.

SKF Puts the Right Bearing in the Right Place

All the Power Delivered to the Work and No Bearing Troubles with SKF on Presses

A GIANT of power that keeps going day after day . . . without trouble. That is the kind of service SKF Ball Bearings make possible on this 20-ton power press and . . . that is the reason why they have been used on machines built by the General Manufacturing Co. since 1921.

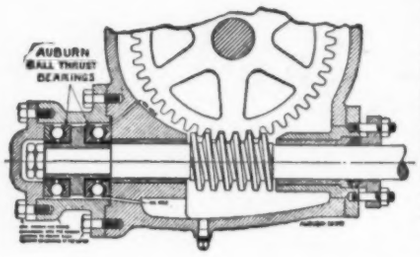
SKF Bearings stand up under heavy, continuous loads without the least effect on their long-life or smooth-operating characteristics. A greater degree of accuracy in the finished product is also possible for SKF Bearings never have to be adjusted and therefore maintain the precision of settings. As a result, all the power is delivered to the work with a corresponding increase in production.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y. 2169

SKF

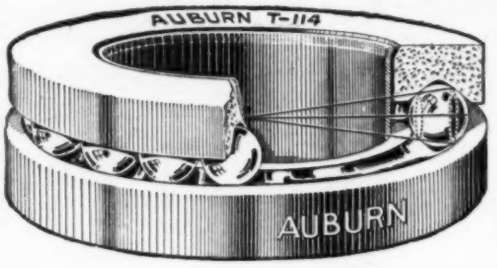
Ball and Roller Bearings

Production Problems answered with Auburn Thrusts



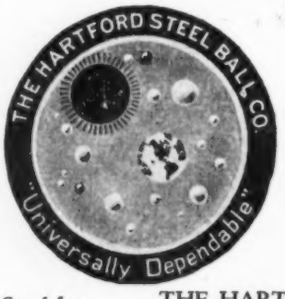
Machine Shut Downs are serious delays where production must be kept at a steady rate. Auburn Ball Thrust Bearings by their special features withstand heavy service and have a long life. For Special Fixtures and Tools, Auburn Bearings are just what is needed whenever there is End Thrust to be cared for. Ask for data sheets and send details of your problem.

Steel, Brass and Bronze Balls



AUBURN BALL BEARING CO. Established 1893 65 Clarissa St., ROCHESTER, N. Y.

Size and Sphericity



HARTFORD METAL BALLS for Bearings are made to closest limits in size and sphericity. They are true spheres, consequently frictionless to a final degree.

Hartford Carbon and Chrome Alloy Steel Balls are heat treated by the latest methods of heat control and are thus uniform.

Hartford "Universally Dependable" Balls are also made in Bronze, Monel Metal and Stainless Steel. May we mail the Descriptive Folder and Prices?

Send for Circular

THE HARTFORD STEEL BALL CO.
Makers of Steel Balls for Bearings, Burnishing Balls and Materials
609 Franklin Ave., HARTFORD, CONN.

STRENGTH—Accuracy—Economy—these are the outstanding features of B. C. A. Thrust Ball Bearings.

THE BEARINGS COMPANY OF AMERICA
LANCASTER, PA. DETROIT MICH. OFFICE, 1012 FORD BLDG.

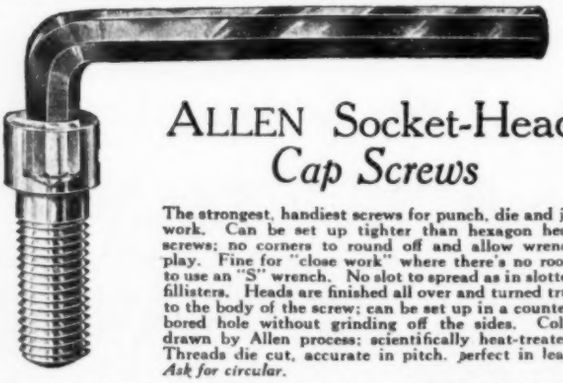
UNBRAKO

Hollow Set and Sockethead Cap
SCREWS

"UNBRAKO" Screws are famous for their unusually accurate and clean threads. The **"UNBRAKO"** won't fracture, won't round in the hex, won't mushroom. A complete line always in stock.

Write us for free samples and Form 398.

Standard Pressed Steel Co.
Box. 4 Jenkintown, Pa.



ALLEN Socket-Head *Cap Screws*

The strongest, handiest screws for punch, die and jig work. Can be set up tighter than hexagon head screws; no corners to round off and allow wrench play. Fine for "close work" where there's no room to use an "S" wrench. No slot to spread as in slotted fillisters. Heads are finished all over and turned true to the body of the screw; can be set up in a counterbored hole without grinding off the sides. Cold drawn by Allen process; scientifically heat-treated. Threads die cut, accurate in pitch, perfect in lead *Ask for circular.*

THE ALLEN MFG. CO. 129 SHELDON ST. HARTFORD, CONN.

BRISTO *Socket Head* CAP SCREWS

FORGED from nickel steel for great strength and toughness. Bristos take the terrific strain of heavy punch and die stamping and similar work. Write for folder with complete information. The Bristol Co., Waterbury, Conn.

"For the Toughest Jobs"
MAC-IT SCREWS
The Strong, Carlisle & Hammond Co.
Cleveland, Ohio

The KELLERFLEX "BK" Machine
Has Distinctive Features of Superiority

Automatic adjustment to position. Speed range 850 to 11,000 r.p.m., Power—Flexibility—Control. Equipped for Die Sinking, Tool Making, Polishing, Grinding, Paint Removal, Routing, Milling, Drilling and Snagging. New uses being found daily.

KELLER MECHANICAL ENGINEERING CORP.
76 Washington St., BROOKLYN, N. Y.

Contract Work

THE HARTFORD SPECIAL MACHINERY CO.

TOOLS AND FIXTURES

HARTFORD, CONN.

ESTIMATES PROMPTLY FURNISHED

SPECIAL MACHINERY DESIGNED AND BUILT

DESIGNERS AND BUILDERS OF SPECIAL MACHINERY.
PARTS MANUFACTURED IN QUANTITIES.

LINCOLN MACHINE COMPANY
PAWTUCKET, R. I.

ONE OR A MILLION

Competent electrical and mechanical engineers. Machine shop equipment includes screw machines, lathes, shapers, grinders, drills, foot-power-and-hydraulic presses. Production, drafting and design. Invention development and contract work.

HUHN MFG. CO.
Highbridge, New York City, N. Y.

Have Your Dies, Jigs, Fixtures and Bakelite Molds Made by Krasberg

First Class Work and Service Always

Also Contract Manufacturing of Metal Articles or Parts

37 years of experience in building special machinery

Krasberg Tool & Mfg. Co.
2156 Fulton St., Chicago, Ill.

WE SPECIALIZE

on tools that incorporate the Five Fundamental Tool Virtues. As a result we offer to make for you:

Tools that are time saving.
Tools that are foolproof.
Tools that are easy to manipulate.
Tools that will give largest possible production.
Tools that will give absolute interchangeability.

Send us your blueprints and specifications. We specialize in difficult toolwork such as the average toolroom has difficulty in handling. Will gladly furnish estimate and will make prompt delivery.

Precision Engineering Co.
(formerly Arthur Brock Tool & Mfg. Works, Inc.)
533 North 11th Street, Philadelphia, Pa.

Machine Work Wanted
Franklin Machine Company
Engineers Founders Machinists
Providence, R. I.

Corliss Steam Engines, Textile Machinery
Special Machinery of all kinds

COMMERCIAL HEAT TREATING
Carburizing, Hardening, Tempering and Coloring in quantity.

AMERICAN METAL TREATMENT CO.
Elizabeth, N. J.

DIES—JIGS—FIXTURES
Special Machinery
The COLUMBUS
Die Tool & Machine Company
Columbus, Ohio.

MACHINE WORK
MANUFACTURING PARTS
FINISHING CASTINGS

EFFICIENT MACHINE SHOP
149 Baxter St., New York City

TRADE **MEHL MADE** MARK

High Grade Jigs, Fixtures, Dies, Gauges and Special Machines

Send for free illustrated prospectus

Mehl Machine Tool & Die Co.
Roselle, N. J.
Established 1913
Thirty Minutes from New York City

Have Your Jigs and Tools Kept Pace With Modern Improvements?

There is only one way to be sure—call in the specialist. Consult the contract shop which concentrates on time-and-money-saving methods of tooling.

Consult the **CONTRACT WORK** Section AMERICAN MACHINIST

SEARCHLIGHT SECTION

USED MACHINERY & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches.....$5.00 an inch
4 to 7 inches..... 4.80 an inch
8 to 15 inches..... 4.60 an inch

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

A.M.

POSITIONS VACANT

Massachusetts

WANTED by Eastern firm manufacturing surface grinding machines and grinding wheels, single man, age 25 to 30, to become demonstrator. Must have general machine shop experience including grinding and at least the equivalent of high school education. Reply in own handwriting. P-218, American Machinist, Tenth Ave. at 36th St., New York.

New Jersey

EXPERIENCED man to take charge of press department manufacturing small sheet metal stampings. One who can properly instruct operators, who can plan so that idle machine time is cut to a minimum and who can supervise the department and bring it up to date is required. Some experience in time and motion study would be helpful but not essential. P-211, American Machinist, Tenth Ave. at 36th Street, New York.

Ohio

MECHANICAL DRAFTSMAN, first class experienced man on machine tool layout work. Splendid opening for the person of proper qualifications. Position open with a large machine tool manufacturer located in South Western Ohio. Give details of education, total experience, state age, married or single. P-217, 7 So. Dearborn St., Chicago, Ill.

Pennsylvania

GRINDING foreman, assistant, having practical experience on grinding, a thorough knowledge of modern production grinding equipment, initiative and ability to handle men. Satisfactory references and co-operative personality required. Location Eastern Pennsylvania. Reply stating experience and age. P-192, American Machinist, 1600 Arch Street, Philadelphia, Pa.

Rhode Island

TIME study man, with machine shop experience. Familiar with all operations, in order to establish standards from studies made. Must be congenial and have ability to handle men. P-207, American Machinist, Tenth Ave. at 36th St., New York.

EMPLOYMENT SERVICE

IF YOU are qualified for position between $2,500 and $25,000 and are receptive to negotiations for new connection, your response to this announcement is invited. The undersigned provides a thoroughly organized service, established nineteen years ago, to conduct confidential preliminaries, and assist the qualified man in locating the particular position he desires. Not a registration bureau. Retaining fee protected by refund provision, as stipulated in our agreement. Send name and address only for description of service. R. W. Bixby, Inc., 266 Main Street, Buffalo, New York.

$3,000.00-$30,000.00 men find our service effective in making connections. Individual. Confidential. Refund agreement. Not agency. Jacob Penn, Incorporated, 9 Park Place, New York.

ENGINEERING EMPLOYMENT
American Association of Engineers
Employment Department
Established with national reputation.
63 E. Adams St., Chicago, Ill.
Engineers, Plant Managers, Executives, Designers, Draftsmen, Juniors
Low rates: reductions to A.A.E. members.

POSITIONS WANTED

Connecticut

MACHINE shop superintendent, have several years' experience manufacturing very heavy and medium machinery (not machine tools) well versed in modern manufacturing methods, planning and time study. Capable mechanic and executive, able to obtain results, location immaterial. PW-193, American Machinist, 7 South Dearborn Street, Chicago, Ill.

New Jersey

SUPERINTENDENT or general foreman. Practical mechanic, age 40, twenty years' shop experience; past twelve years in charge of building machine tools, special machinery and automotive equipment; able to handle men and produce. PW-185, American Machinist, Tenth Ave. at 36th Street, New York.

MODERN practical shop executive, 40, married, 26 years' factory experience, real producer on production, well versed in toolwork and manufacturing small interchangeable parts. Successful record as toolroom foreman, production engineer and superintendent. A-1 references. Available January, 1929. PW-208, American Machinist, Tenth Ave. at 36th St., New York.

New York

ENGINEER (Scotch), speaking French and Dutch, located in Antwerp, desires connections with American firms for the erection and demonstrating of machines, automatic, steam, electric, hyrdaulic. Any part of Europe, or at European Commercial Exhibitions. Address D. C., Room 545, 18 West 34th St., New York.

POSITIONS WANTED

EXECUTIVE foreman B. & S. automatic screw machine specialist, desires change of position. 15 years' practical experience, with technical knowledge of plotting cams for any kind of work. Preference given to positions within 15 miles of New York City. PW-663, American Machinist, Tenth Ave. at 36th St., New York.

FOREMAN, to take charge of die casting department, having years of experience, at present employed, wishing to make change. PW-210, American Machinist, Tenth Ave. at 36th St., New York.

MACHINE SHOP or tool room foreman, expert dies, jigs, gages, small medium parts. Practical mechanic, technical education, American born, age 43, 20 years' experience. PW-213, American Machinist, Tenth Ave. at 36th Street, New York.

Ohio

MACHINE designer: 14 years' experience in design and development of new machinery. Thirty-six years old, technical education. Married. Neat, accurate, capable. Location does not matter. PW-212, American Machinist, 7 So. Dearborn Street, Chicago, Ill.

SALESMEN WANTED

Machine Tool Salesmen

Two high-grade men. Must be experienced and willing to work hard and travel for large New York dealer. Write full details in own handwriting with strict confidence. SW-214, American Machinist, Tenth Ave. at 36th Street, New York.

Jones & Lamson Machine Co.
Springfield, Vermont

Have Openings for Several Men in Engineering Department

1. A high grade man with several years' experience in this line to work on machine design with Chief Engineer.
2. Several men for junior positions in drawing room. Some qualified to do layout work on special tools. Some for tracing and detailing.

In making application state age, family, experience, references and salary desired.

REPRESENTATIVES WANTED

Representatives Wanted

who have experience calling on foundries and railroad shops, to sell specialties used by same. Apply to The MacLeod Company, Station "B," Cincinnati, Ohio.

Attention—Abrasive Wheel Representatives

Wanted, established representatives, familiar with grinding practice, for a line of diamond wheel dressing tools. Choice territories available in New York, Ohio, Indiana, Pennsylvania and Minnesota on liberal commission basis. Product has excellent and highly desirable mechanical features. An opportunity to become associated with a progressive concern now building a permanent sales organization. RW-215, American Machinist, Tenth Ave. at 36th Street, New York.

REPRESENTATIVES AVAILABLE

Sales Engineer

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USED BOLT CUTTER

(In Chicago) must be in reasonably good condition for threading bars up to 3 in. capacity, also set of angle rolls 6x6x½ or similar.

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(ORIGINATED BY US)
Reg. U. S. Pat. Off.

Immediate Deliveries on GRINDERS

These grinders are typical of all those listed below.

GRINDERS
1—26"-37½"x96" Norton Gap.
1—24x96" Norton.
1—18x96" Norton.
2—16x50" Norton.
4—14x50" Norton.
5—14x36" Norton.
2—12x120" Landis.
1—12x36" Modern.
1—12x36" Fitchburg.
1—10x120" Norton.
1—10x72" Norton.
1—10x52" Landis.
6—10x50" Norton.
1—No. 14 10x30" B. & S.
5—10x36" Norton.
5—10x36 Landis.
2—10x24" Landis.
7—6x32" Norton.
1—6x18" Landis.
1—16"x48" Landis Crank.
2—No. 3 B. & S. Univ.
2—No. 2 B. & S. Univ.
1—12x36" Cincinnati Univ.
1—No. 50 Heald.
1—No. 60 Heald.
1—No. 70 Heald.
1—No. 75 Heald.
1—No. 10-A Bryant Internal.
2—No. 20 Bryant Internal.
1—No. 19 53" Besley Disc.
2—No. 7 Gardner Disc.

SLAB MILLING MACHINES
1—24x13"x20' Ingersoll.
1—24x24"x 8' Ingersoll.
3—24x24"x12' Ingersoll.
1—36x10"x7' Newton.
1—45"x17' Ingersoll.
1—50"x20' Ingersoll.
1—No. 3 92x54"x15' Beaman & Smith Milling and Boring Machine, Planer Type.
1—Beaman & Smith open side.
1—3-spdl. Beaman & Smith.

HAND SCREW MACHINES
1—No. 10 3" Bardons & Oliver.
3—No. 8 2½" Warner & Swasey.
2—No. 6 2¼" Warner & Swasey.
1—2"x10" Acme.
1—1⅛"x9 Acme.
1—No. 3 ¼" Bardons & Oliver.

PRESSES
1—No. 57 Toledo ⅜" continuous stroke forging.
5—No. 58 Toledo ¾" continuous stroke forging.
1—No. 67 Consolidated.
1—No. 68 Stoll.
1—No. 39½ Bliss Horning.

MISCELLANEOUS
2—No. 12 B. & K. Pipe Machine.
1—24" Niles Slotter.
1—24" Newton Slotter.
1—9" Sellers.
18—Pilton Slotters.
2—No. 4 LaPointe.
1—No. 4 J. N. LaPointe.
1—No. 2 N.-B.-P. Axle Lathe.
1—8-spindle N.-B.-P. Arch Bar Drill.
5—No. 3-E Lees-Bradner Thread Miller.

—And on all these others, too

LATHES
1—48"x50' Pond.
1—45"x24' Pond.
1—42"x50' Putnam, Gd. Hd.
1—42"x50' American, Gd. Hd.
1—40"x12' Fifield.
1—36"x71' American, Gd. Hd.
1—36"x42' Gisholt Gun Borer.
1—30"x11' H. S. & G.
1—27"x14' Reed-Prentice, Gd. Hd.
2—26"x18' Bridgeford.
5—26"x16' N.-B.-P.
2—26"x16' Whit.-Blaisdell.
10—26"x16' Bridgeford.
5—26"x14' Bridgeford.
5—26"x14' N.-B.-P.
1—26"x13' Wickes.
3—26"x12' Putnam.
5—26"x12' Bridgeford.
13—26"x11' Wickes.
40—26"x10' N.-B.-P.
15—26"x10' Canada.
15—26"x10' Whit.-Blaisdell.
41—26"x10' Bridgeford.
61—26"x9' Bridgeford.
16—26"x8' Bridgeford.
9—25"x12' LeBlond.
20—25"x10' Sidney.
1—24-48"x20' Rahn-Larmon Gap.
1—24"x20' Reed-Prentice, Gd. Hd.
1—24"x18' L. & S., Sel. Gd. Hd.
1—24"x16' L. & S. Sel. Gd. Hd.
5—24"x10' Cisco.
1—22"x10' Rockford.
5—20x22"x16' American.
5—20x22"x12' American.
1—20"x10' Hamilton, M.D.
2—20-22"x8' American, M.D.
30—20-22"x8' American.
1—18"x9' Chard.
1—18"x8' Lodge & Shipley.
1—18"x8' Greaves-Klusman.
1—16"x16' American.
1—16"x14' Reed-Prentice, Gd. Hd.
1—16"x12' Sundstrand Mfg.
1—16"x10' Sundstrand Mfg.
1—16"x8' Lodge & Shipley.
2—14"x6' Flather.
2—14"x6' Rockford.
5—3⅛" Fitchburg Loswing.
1—3⅛"x108" Loswing.

AUTO SCREW MACHINES
7—No. 6-A Potter & Johnston.
2—No. 5-A Potter & Johnston.
2—5⅛" Cleveland.
1—No. 56 National Acme.

TURRET LATHES
1—26" Libby.
26—24" Davis.
10—24" Steinle.
3—24" Gisholt, M.D.
3—21" Gisholt.
1—18" Libby.
26—21"x10' LeBlond, Univ.
3—20"x8' American.
24—19"x8' LeBlond, Univ.
25—19"x8' LeBlond.
3—3x36" Jones & Lamson.
7—2-spdl. Jones & Lamson.

GEAR CUTTERS AND HOBBERS
1—No. 5 60" Brown & Sharpe.
1—36"x12" G. & E.
1—No. 13 Brown & Sharpe.
1—12"x10" G. & E.
1—No. 6 Fellows.

OUR GUARANTEE

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DRILL PRESSES
1—No. 3 6-spindle Foote-Burt.
2—No. 4 4-spindle Foote-Burt.
1—No. 17 4-spindle Foote-Burt.
1—4-spindle Kern.
3—No. D-31 Fox Mult.
1—No. 14 Natco.
1—20" Fairbanks.
1—20" 4-spindle Barnes.
1—22" Barnes, Self-Oiling.

HORIZONTAL BORING MACHINES
1—No. 12 Pawling & Harnischfeger.
2—4" Gisholt.
1—No. 0 Fosdick.
1—3" Bar Lucas.
1—No. 2 Barnes Double End.
1—No. 3 Barnes Single End.
1—2-spindle Espen-Lucas Boring, Milling and Drilling Machine.
1—No. 3 Beaman & Smith Engine Frame and Cylin. Borer.
1—Beaman & Smith Cylinder Boring and Milling Machine.

VERTICAL BORING MILLS
1—10' Niles.
1—72" Gisholt.
1—60" Niles.
1—60" Pittsburgh.
1—48" Colburn.
2—42" Gisholt.
1—42" King.
1—42" Colburn.
1—42" Bullard, New Era.
1—36" Bullard, New Era.
1—36" Bullard, Rap. Prod.
1—36" Gisholt.

RADIAL DRILLS
1—5' Reed-Prentice.
1—5' Prentice.
1—4' Western, heavy.
1—4' Fosdick.
1—4' Reed-Prentice.
1—3' Western.

MILLING MACHINES
1—No. 4 Cincinnati.
3—No. 3 Brown & Sharpe.
1—No. 2 Kempsmith.
2—No. 2-Y Brown & Sharpe.
4—No. 25 Becker.
1—No. 1 Kempsmith.
3—No. 0 Brown & Sharpe.
1—No. 0 Rockford.
1—No. 3 Becker Univ.
1—No. 2 Hendey Univ.
2—No. 1½ Garvin Duplex.
2—No. 1 Van Norman, Hand.
4—Type B Briggs.
2—Putnam Semi-Auto.

VERTICAL MILLERS
1—Model AC8 2-spdl. Becker.
2—Model 8D Becker.
5—No. 4 Cincinnati.
2—No. 6 Becker.
2—No. 5-B Becker.
2—No. 3 Cincinnati.
1—No. 3-B Milwaukee.
1—No. 2-B Milwaukee.
1—No. 4-B Becker.
1—Model CS Becker.

PLANERS
1—72x84"x12' Gray.
1—48x48"x10' N.-B.-P.
1—42x42"x 9' Niles-Bement-Pond.
1—42x36"x14' Cincinnati.
3—36x36"x18' Cincinnati.
1—36x36"x16' Rockford.
1—36x36"x16' Ohio.
1—36x36"x10' Gray.
2—36x36"x 8' Ohio.
1—36"x32"x8' Cincinnati.
1—36x30"x20' Whit.-Blaisdell.
1—36x30"x18' Whit.-Blaisdell.
1—30x30"x14' Niles-Bement-Pond.
1—30x30"x 8' Niles-Bement-Pond.
1—30x30"x 8' Liberty.
1—24"x24"x 8' Powell.
2—24x24" 6' Gray.
1—24x24"x6' Ohio.
3—24x24"x6' Woodward-Powell.

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A Few Selections from Stock of "2000" "Restored" Machines

1—96-H GOULD & EBERHARDT GEAR HOBBER, 96" CAPACITY
1—32" CINCINNATI CONE DRIVEN SHAPER
1—32" GOULD & EBERHARDT MOTOR DRIVEN SHAPER
1—NO. 22 HEALD ROTARY SURFACE GRINDER
3—NO. 2 CINCINNATI HIGH POWER VERTICAL MILLER, SINGLE PULLEY DRIVE
5—NO. 3 CINCINNATI HIGH POWER VERTICAL MILLER, SINGLE PULLEY DRIVE
1—NO. 3 CINCINNATI HIGH POWER PLAIN MILLER, SINGLE PULLEY DRIVE
1—NO. 4 CINCINNATI HIGH POWER PLAIN MILLER, MOTOR DRIVE
1—NO. 5 CINCINNATI HIGH POWER PLAIN MILLER, RECTANGULAR OVER-ARM
1—72" x 58' NILES-BEMENT-POND HEAVY DUTY LATHE, 2 CARRIAGES RAPID TRAVERSE, MOTOR DRIVE
1—48" x 21' NILES-BEMENT-POND GEARED HEAD, RAPID TRAVERSE
2—42" x 39' PUTNAM GEARED HEAD LATHES, 2 HEADS, RAPID TRAVERSE
1—42" x 18' AMERICAN GEARED HEAD LATHE, MOTOR DRIVE
2—30" x 12' AMERICAN GEARED HEAD LATHES, MOTOR DRIVE
1—24" x 12' PRENTISS GEARED HEAD ENGINE LATHE, MOTOR DRIVE
1—72" GISHOLT VERTICAL BORING MILL, 2 HEADS RAPID TRAVERSE
1—42" KING VERTICAL BORING MILL, TURRET AND SWIVEL HEAD, RAPID TRAVERSE
1—NO. 0 GIDDINGS & LEWIS HORIZONTAL BORING MILL
2—2¼" GRIDLEY FOUR SPINDLE AUTOMATICS
5—1¼" GRIDLEY FOUR SPINDLE AUTOMATICS
8—NO. 00 BROWN & SHARPE AUTOMATICS, MOTOR DRIVE
10—NO. 4 WARNER & SWASEY FRICTION HEAD SCREW MACHINES
1—26" LIBBEY TURRET LATHE, 6" HOLE, SINGLE PULLEY DRIVE
3—NO. 3-A WARNER-SWASEY UNIVERSAL TURRET LATHE, BAR EQUIPMENT
6—NO. 2-A WARNER-SWASEY UNIVERSAL TURRET LATHE, BAR AND CHUCKING
1—10' x 10' x 20' BEMENT PLANER 4 HEADS, REVERSING MOTOR DRIVE
1—10' x 6' x 16' NILES-BEMENT-POND 4 HEADS, REVERSING MOTOR DRIVE, RAPID TRAVERSE
1—84" x 84" x 15' POND PLANER, 4 HEADS, REVERSING MOTOR DRIVE
1—72" x 72" x 16' DETRICK-HARVEY OPENSIDE, 3 HEADS BELTED MOTOR DRIVE
1—72" x 72" x 18' DETRICK-HARVEY OPENSIDE PLANER, 3 HEADS REVERSING MOTOR DRIVE
1—5' AMERICAN TRIPLE PURPOSE PLAIN RADIAL, SINGLE PULLEY DRIVE *(Advise Us of Your Requirements)*
1—6' AMERICAN TRIPLE PURPOSE PLAIN RADIAL, MOTOR ON ARM *Ask for Catalogue*

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Year in and year out Miles' rebuilt tools continue to give lasting satisfaction. We believe that to be the reason our business has more than doubled in the past year.

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5/16 in. No. 00 Brown & Sharpe (15).
⅜-in.-½-in. Cleveland Model A.
⅝, 1¼, and 2¾-in. Gridley 4 spindle.
3¼-in. Gridley single spindle.
14-in. Fay chucking.
Nos. 5A and 6A Potter & Johnston.
No. 22 New Britain chucking.
Hartness tilted automatic.
No. 2P Potter & Johnston piston and piston ring.
1-in.x5-in. and 1⅝-in.x7-in. New Britain, six spindle (2).

DRILLS, RADIAL

3-ft. American sensitive.
3-ft. Mueller.
3½-ft. American.
3½-ft. Bickford.
4-ft. Hammond hinged arm, sensitive.
4-ft., 5-ft., 6-ft. and 8-ft. Western.

GRINDERS, CYLINDRICAL

6x18-in., 10x20-in., 10x24-in., 10x36-in., 10x52-in. and 12x36-in. Landis.
6x32-in., 10x36-in., 14x50-in. and 14x72-in. Norton.
8-ft.x18-in. ORT.
8x18-in. and 12x24-in. Modern.
8x20-in. Fitchburg Model A.
10x36-in. No. 2 Webster & Perks Universal.
10x48-in. Brown & Sharpe No. 14.
12x20-in. Cincinnati.

GRINDERS, SURFACE

50x22x18-in. Safety Emery Wheel Co.
12-in. Arter rotary.
8-in. No. 20 and 12-in. No. 255 Heald rotary.
14x36-in. Pratt & Whitney vertical.
18x6x9½-in. No. 2 Brown & Sharpe.
8-in. Pratt and Whitney rotary.
26x8x13-in. Manhattan.

KEYSEATERS

1-in. No. 0 Baker.
2½ No. 4 Mitts & Merrill.
4-in. No. 6A Mitts & Merrill.

PUNCHES

4-in. throat, ⅞x⅝-in. No. 1 Hilles & Jones horizontal.
12-in. throat 1x1-in. Cleveland horiz.
13-in. throat 1½x1-in. Kling horiz.
4½x1-in. throats double end shear.
48-in. throat Southwark, No. 8. Cap'y 2x2-in. Arch. jaw.

PLANERS

30x30"x8' Cleveland openside. 1 rail and 1 side head. Constant speed motor drive.
36x36"x12' Cincinnati Heavy Pattern, 3 heads. Motor drive (constant speed).
48x48"x12' Pond. 3 heads. Belt drive.
72x72"x18' Pond. 4 heads. Constant speed motor drive.

HAMMERS

600-lb. Buffalo steel frame, "combined" type, steam.
600-lb. Niles Bement Pond steam forging.
40 and 100 lb. Bradley cushioned helve.
50 and 150 lb. Bradley upright strap.
25-lb. No. 0 United.
No. 2B Nazel pneumatic.
Nos. 50 & 60 New Boyer air riveting.
All makes of chipping hammers.
Pettingell bumping. Nos. 1 and 2.
225-lb. Bliss 4-poppet drop press (or belt drop hammer).

RIVETERS

No. 3-A High Speed.
3/16-in. No. 80 and 5/16-in. No. 107 Grant spinners.
Type B Kobert Electric, 10 kva.
20-ton Allen pneumatic, 19-in. reach, 9½-in. gap.
20-ton Allen lattice column, 6-in. reach, 8⅝-in. gap.
50-ton Hanna, 12-in. reach, 15-in. gap.
50-ton Allen, 72-in. reach, 15-in. gap.

ROLLS, BENDING, ETC.

72x¼-in. Wickes, Drop end.
10x⅝-in. Plate Straightening Rolls.
36x16-in. ga. Niagara slip roll. New.
44-in.x18-in. ga. Southwark plate straightening rolls or mangle.
2⅝x36-in. slip roll former, hand and belt drive.
6-ft.x12 ga. bending roll, drop end, hand and belt drive.

SAWS, METAL

6x6-in. Armstrong Blum No. 5 hack.
6-in.x6-in. Racine Hack.
6-in.x6-in. Peerless Shaping.
4-in. Higley, cold.
6-in. No. 1 Klemm metal band.

SHAPERS

15-in. Steptoe.
16-in. Springfield.
16-in. Smith & Mills, sgle. pulley drve.
20-in. Steptoe.
24-in. Gould & Eberhardt. "High Duty."
24-in. Kelly.
25-in. Springfield.
30-in. Walcott.

SHEARS

¾-in. Kling plate splitting.
¾-in. Marshalltown Rotary Bevel.
10 ga. No. 10P Marshalltown throatless rotary.
36-in.x18 ga. Niagara foot power squaring. NEW.
30-in. and 60-in. throat Pettingell rotary, 14 ga. capacity.
No. 4 Ryerson quadruple, type 8CAP, angle, bar and plate shear, punch and coper.

SLOTTERS

14-in. Niles.
18-in. Niles.
3½-in. Pratt & Whitney die.

TAPPERS

Garvin Nos. 1, 2, 2X and 2 B.G. Capacities ⅝ in. to 1¼ in.
½-in. No. 2H Garvin horizontal.
⅝-in. No. 4 Simmons Cincinnati Hy-Speed.
Rickert-Shafer ⅝-in. Have both vertical and radial types.

THREADERS (BOLT CUTTERS)

⅝-in. Webster & Perks 2 spindle.
½-in., 1-in. and 4-in. Landis.
⅝-in. Geometric with 1-in. die head.
⅝-in. No. 2 Adams.
1-in. No. 372 Greenfield "Little Giant."
1-in. Foote Burt 2 spdle., Landis hds.
1-in. and 1¼-in. National.
2-in., 2½-in. and 3-in. Acme.
2-in. Landis 2 spindle.

UPSETTERS

These are all steel bed machines.
1-in. Ajax continuous motion, rir. feed.
2-in. Acme stop motion.
2-in. Ajax stop motion.

WELDERS

Ryerson - McGrath pneumatic flue welder, dies 2-in. to 5½-in.
150 amp. Wilson "Plastic Arc."
200 amp. C. and C. arc.
200 and 600 amp. Lincoln arc.
42-in. throat, 125 amp. Vollans spot.
10 kw., 18-in. reach Thompson spot welder, capacity No. 12 ga.
13-in. reach, 16 ga. capacity Vollans spot welder.
½-in. Vollans butt.
1-in. Winfield butt, type B4.
1½-in. Winfield butt.

MILES
MACHINERY COMPANY
SAGINAW, W. S.
MICHIGAN

Pin your confidence on Morey Tools

BORING MILLS
1—BAUSH 42" ver. 2 heads.
1—NILES 42" ver. 2 heads.
1—PUTNAM 44" ver. 2 heads.
1—CINCINNATI 6' ver. 2 heads.
1—NILES 96" ver. 2 heads.
1—BETTS 10' ver. 2 heads.
1—N-B-P 10-16' ver. 2 heads.
1—POND 10-24' ver.
1—N.B.P. 4½" bar Duplex Control Hor.
1—CLEVELAND 2⅛" bar hor.
1—ROCKFORD No. 2 hor.
1—PAWLING & HARNISCHFEGER 3¼" bar.

DRILLS—MULTIPLE SPINDLE
16—BAUSH Nos. 1, 2, 3.
5—DETROIT 5-spindle.
5—NATCO Nos. 11, 12, 13, 14.
1—P. & W. Nos. 12, 13.

DRILLS—UPRIGHT
6—ALLEN 1, 2, 3, 4 and 6-spindle.
3—BAKER No. 310.
1—HENRY & WRIGHT 4-spindle.
1—PRATT & WHITNEY No. 2 Gun.
1—NEW TURNER No. 3 Ver.

DRILLS—RADIAL
3—WESTERN 3' Pl.
1—AMERICAN 4' Pl.
1—AMERICAN 4' Pl. triple purpose.
1—BAUSH 6'.
2—DRESES 5', 6' Pl.
1—CINCINNATI BICKFORD 6' pl.
1—NBP 96" Plain.

SHAPERS AND SLOTTERS
1—GOULD & EBERHARDT 16-".
1—CINCINNATI 20".
1—STEPTOE 20".
4—DILL 15-18" Slotter.

GEAR CUTTERS
7—B. & S. 3x26, 3x36, 4x36.
3—B. & S. No. 6, 60" cap.
5—BARBER-COLMAN Nos. 3, 12.
1—G. & E. No. 18-H.
1—CINCINNATI 16" Gear Hobber.
3—FELLOWS No. 6; 61.
3—GLEASON 15" Spiral Bevel Roughers.
4—GLEASON 6", 11", 18".
1—GLEASON 24" Bevel Gear Planer.
1—LEES-BRADNER No. 5-A.
3—FELLOWS Gear Grinders.
10—CROSS Gear Tooth Rounders.

GRINDERS
1—HEALD Rot. Sur., 8"&12" chucks.
5—B. & S. Nos. 10, 11, 12, 13, 14.
4—CIN. No. 2, 12x36 Pl.
9—LANDIS 6x18, 10x24, 10x36, 12x36, 12x96 Pl.
6—NORTON 3x18, 6x32, 10x24, 10x36, 10x50, 16x36 Pl.
3—LANDIS 10x52 Cam; 16x48 Crank.
1—PERSONS ARTER 8-in. Surf.
5—B. & S. No. 1, 2, 3, Univ.
1—DIAMOND No. 2 Surf.
1—SPRINGFIELD BRANDES No. 3 Planer Type Surf.
12—HEALD Nos. 65, 60, 70.

LATHES
1—AMERICAN 16"x8'; SPD.
1—HENDEY 14"x6'.
1—HENDEY 16"x8'; gd. bd.
1—LODGE & SHIPLEY 18x10 Selective grd. bd., with taper att.
3—LEBLOND 26"x10' Dup. Crank.
1—JOHNSON 30"x12'; M. D.
1—HENDEY 24"x12'.
1—BRIDGEFORD 32"x26'; pat. grd.
1—BRIDGEFORD 42"x38'; grd. bd.
2—LOSWING 5½x84; 2 car.

TURRET AND SCREW MACHS.
1—ACME Fox Monitor.
6—FOSTER Nos. 2, 4, 6.
4—GREENLEE 2¼x26.
16—J. & L. 2¼x24, 3x36.
2—LIBBY 26", 4½" hole.
1—W. and S. No. 6.
1—B. and S. No. 6.
2—W. & S. No. 2-A.

AUTOMATIC SCREW MACHS.
14—CLEVE. ⅝", ⅞", ¾", 1¼", "A."
4—CLEVE. ⅝", ⅞", ½", 1¼", "B."
17—GRIDLEY ⅜", ⅞", 1¼", 1⅜", 1¾", 2¼" 4 spdle.
10—GRIDLEY 2¼", 4¼" single.
6—NEW BRITAIN Nos. 23, 24.
4—NATL. ACME Nos. 52, 54, 56, 515.
11—P. & J. Nos. 5-A, 6-A.

MILLING MACHINES
2—CINCINNATI 18" duplex.
6—B. & S. Nos. 2, 2-B, 3, 4 Pl.
8—CIN. Nos. 2, 3, 3-S, 4 Pl.
2—GARVIN No. 13½ Pl.
1—LEBLOND No. 4 Univ., ver. hd. dividing hd., slotting att.
2—GARVIN No. 1½ Univ.
1—B. & S. No. 3 Ver.
13—BECKER Nos. 3H, 4B, AB, 5C, 6, C1 Ver.
1—P. & J. No. 2-V Ver., SPD.
7—P. & W. 4½x12, 6x14, 6x48, 6x80 Thread.
10—P. & W. 5", 8", and 10" Auto.

PLANERS
2—PUTNAM 26x26x8', 2 heads.
1—GRAY 28x38x20', 3 heads.
1—PUTNAM 48x48x12', 2 heads.
1—WOODWARD & POWELL 36" x36"x16', 4 heads.
1—WOODWARD & POWELL 42" x42"x12', 2 head.
1—BEMENT 14'x10'x24', 4 heads M.D.

HAMMERS
1—NEW BRADLEY, 30-lb. Helve.
4—BRADLEY 60-lb. Helve.
6—BRADLEY 80-lb. Helve.
2—BRADLEY, 100-lb. Upright Helve.
3—CHAMBERSBURG 400, 600, 800 lb. Bd. Drop.
1—B. & S. 800-lb. Drop.
1—TOLEDO 1500-lb. Bd. Drop.

MISCELLANEOUS
LA POINTE Broaches (Hudson & New London) 1, 2, 3 and 4.
1—LAIDLAW, DUNN & GORDON 17x16 Air Compressor.
1—ETNA No. 5-A Swage.
3—CLAYTON Air Compressors.
1—KELLER E-3 Engraver.
5—FISHER No. 1 Oil Groovers.
1—WICKES single end Punch.
1—CLEVELAND Model "C" Double End Punch and Shear.
1—STOVER 6" Pipe M. D.
1—NEWTON 42" Cold Saw.
1—ESPEN LUCAS 43" Cold Saw
1—NEWTON 62" Cold Saw.
1—CAMPBELL 3-16" Nibbler.
1—ALLEN 108" Beach Portable Riveting Machine.
1—NILSON 3-slide Wire Former.
1—SHUSTER Wire Straightener, ¼".
1—RIEHLE 100,000 lb. Testing.
1—LANGALIER 5-A Swage, Etna No. 5 Swage.
1—NEW AJAX reclaiming roll.
1—NEW ROCKWELL oil burning furnace.
1—MURCHEY duplex nipple mach.

MOREY AND COMPANY, Inc.
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Telephone, Canal 5360

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These are not worn out or discarded tools

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1—No. 2 Horizontal boring and drilling machine, 1 spindle—Rockford...$425
1—Double head gun barrel drilling machine, ¾ in. capacity. 9-ft.9-in. bed like new. Diamond $500
1—Two spindle Horizontal Drilling & Boring Machine, spindle attached to each end of table which is 2-in.x6-ft. Rockford Machine Co. (practically new) $1100

CHUCKING MACHINES
2—No. 6-A Semi-automatic chucking machines, with equipment—Potter & Johnston .....ea.$400

CUTTING-OFF MACHINES
1—Cutting-off machine, 6 in. accelerated speed—Hurlburt & Rogers.....$250
2—Cold metal circular saws No. 14, 18-in. saw—Higley .....ea.$175

DIE SINKING MACHINES
1—No. 2 Die sinking machine—Copper $210
1—No. 2 Die sinking machine with swivel vise—Pratt & Whitney.....$325

MULTIPLE SPINDLE DRILLING MACHINES
1—Type 32—42 spindle motor driven drill press—little used—Nat. Auto. Mach. $2,800
1—Type 32—60 spindle motor driven drill press—little used—Nat. Auto. Mach. $2900
1—Type 32—68 spindle motor driven drill press—little used—Nat. Auto. Mach. $3100
1—No. 4—20 spindle motor driven drill press—Baush $900
1—No. 1—Type 10-B, 20-spindle drill press—Baush $500
1—No. 2—6—2-in. spindles with No. 3 Morse taper—Baush $350
1—Two spindle adjustable Cylinder Boring and Reaming Machine, Foote-Burt, ...$550
1—Four spindle adjustable Cylinder Boring and Reaming Machine, Moline Tool Co. $1000

SENSITIVE DRILL PRESSES
3—20-in. Friction drive sensitive drill—W. F. & J. Barnes.....ea. $25

UPRIGHT DRILL PRESSES
3—20-in swing, heavy duty drill, style F.—Baker Bros. $150
1—24-in. heavy duty upright drill—Foote-Burt $150

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1—24-in. Dia. 10-in. travel of cutter—Gould & Eberhardt $550
1—18-in.x12-in. High Duty Gould & Eberhardt $700

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1—Chaser and die grinder—Geometric.$60
1—Cutter Grinder, Ingersoll Milling Machine Co. $150
1—Drill Grinder, Sellers, Capacity ¼ in. to 2 in. $60

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1—10-in.x72-in. plain grinder with camshaft attachment—thoroughly overhauled—Norton $800
1—14-in.x72-in. plain grinder—thoroughly overhauled—Norton $850
1—No. 11 plain grinder—Brown & Sharpe $175
1—No. 14 plain grinder—Brown & Sharpe—excellent condition $775

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3—Snagging grinders, 2 wheel, Model E—2x2x24-in. wheel—Norton..ea.$100

SURFACE GRINDERS
1—Vertical surface grinder, planer type, table 30-in.x78-in. vertical spindle with 24-in. ring wheel—excellent condition—Springfield Mfg. Co. $2600
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1—1200-lb. board drop hammer, Waterbury Farrell $275
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HIGH PRODUCTION LATHES
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4—No. 5 Lincoln type—Hendey Machine Co. .....ea.$150
1—Type B Briggs—Gooley-Edlund..$425
1—No. 8 Lincoln type—Hendey Machine Co. .....ea.$225
2—Very heavy type duplex, table 20 in.x 5-ft.—Hendey Machine Co....ea.$800

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3—No. 5B Becker & Brainard—ranging from .....ea.$200 to $400

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3—1¼-in.—4-spindle—Gridley..ea.$600
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1—Dynamic Crankshaft Balancing Machine—Akimoff Instrument Co...$350

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Tanks, Root Blower and Miscellaneous electrical equipment 220 volts D.C.
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36-in. Bullard New Era Vertical Turret Lathe.
51-in. Bullard Vertical Boring Mill.
No. 4-A B & S Universal Miller.
No. 13-B B & S Manufacturing Miller.
No. 3-H Becker Profiler.
5-ft. Prentice Plain Radial Drill.
24-in. Hoefer Sliding Head Drill.
No. 4. 48x10-in. B & S Gear Cutter.
No. 11. 4x30-in. B & S Plain Cylindrical Grinders.
No. 14. 10x48-in. B. & S. Plain Cylindrical Grinder.
4—¼-in. Gridley S. S. Screw Machine.
No. 2 B & S Surface Grinder.
12-in. Bement Miles Slotter.
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1—Thomson 20-A Butt Welder.
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Grinder, 16 in. x 42 in., Landis Universal
Grinders, No. 1 and No. 2 Wilmarth & Morman surface
Lathes, 14 in. x 6 ft. Monarch
Lathes, 24 in. x 10 ft. American
Lathe, Hamilton, 14 in. x 6 ft. H. S. Comp. Rest
Lathe, 20 in. x 8 ft. American geared head
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Miller, Kempsmith, No. 1 Universa
Miller, B & S. No. 2 heavy plain
Miller, No. 3 Kempsmith Plain, new
Miller, Briggs type B
Shaper, 16 in. Steptoe B. G. crank
Shaper, 16 in. American tool-room
Shear No. 20, Quickwork, 14 gauge, 30 in. throat
Shear, Pettengill, 60 in. throat
New 3-phase Motors. 5 HP. $65.50, and 3 HP. $54.50.

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1—Flather 40-in. **Spur Gear Cutter.**
1—Fellows No. 62 **Gear Shaper.**
1—Sellers No. 2 **Twist Drill Grinder.**
1—Modern 12x48 **Plain Cylindrical Grinder.**
1—Heald No. 60 **Internal Grinder.**
1—26x9 Bridgeford **Lathe.**
1—16x8 **Pratt & Whitney Lathe.**
1—Gisholt 16-in. Simplified **Roughing Lathe.**
1—No. 32 Kempsmith **Manufacturing Miller.**
1—No. 1½ Brown & Sharpe **Universal Miller.**
1—Ohio 24x24x8-ft. **Planer.**
1—No. 3-A High Speed **Riveter**
1—24-in. Gould & Eberhardt **Shaper.**
1—7-in. Rhodes **Shaper.**
1—No. 11 Highley **Cold Saw.**
1—Jones & Lamson Double Spindle **Flat Turret Lathe.**
2—No. 2-G Brown & Sharpe **Automatic Screw Machines.**

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No. 1½ **LeBlond** universal, cone pulley, complete
No. 5-B **B. & S.** pl., sg. pul., pwr. rpd. tr., late type.
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No. 3-B **B. & S.** pl., sg. pl., pwr rap. tr., late type.
No. 3 **Cincinnati** hi. pwr. pl., sg. pul., late type.
No. 3 hvy. **Ohio** plain cone pulley, pwr. rap. trav.
Nos. 3 and 2-H **Brown & Sharpe** plain, cone pul.
Nos. 2 and 0 ½ **Cincinnati** plain, cone pulley.
Nos. 2 ½ and 2 **LeBlond** plain, cone pulley.
No. 1 ½ **Brown & Sharpe** plain, cone pulley.
No. 3 **Brown & Sharpe** vertical single pulley.
No. 15 **Garvin** vertical spindle milling machine.
No. 2 **Knight** milling and drilling machine.
28 in. **Cincinnati** semi-automatic miller.
No. 13-B **B. & S.** pl. miller, taper spdl., late type.
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No. 6 **Whitney** hand miller.

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5 and 4 ft. **Dreses** hi-duty pl. radials, gear box dr.
4 ft. **Fosdick** pl. radial gear box drive.
4 and 3 ½ ft. **Cinti-Bickford** pl. radials, gr. bx. dr.
3 ½ ft. **Mueller** plain radial gear box drive.
2 ½ ft. **Fosdick** pl. radial cone pulley drive.
4 and 2 ½ ft. **Carlton** bl. br. sens. rad., tap. att.
36 in. **Aurora** upright drill T. A.
28 in. **Prentice Bros.** upright drill.
26 in. **Barnes** all geared drill.
26 in. **W. F. & John Barnes** upright drill (la. typ.)
24 in. **Aurora** upright drill, T. A.
24 in. **Sibley** upright drill.
22 in. **W. F. & John Barnes** upright drill (la. typ.)
21 in. **Cinti-Bickford** upright drill T. A.
20 in. **Cinti-Bickford** upright drill T. A.
6 spdl. **National Acme** horizontal driller.
No. 25, 24-in. **Foote-Burt** heavy duty drill.
Cleveland 4 and 6 spdl. ball bear. drills, No. 2M T.
Leland & Gifford 2 spdle. B. B. drill power feed.
Allen 2 spdle. ball bearing drill, No. 2 M. T.
21 in. **Hoefer** 6 spdle. gang drill.
No. 12 **P. & W.** mult. drill, equip. with 8 spdles.
No. 37 **Natco** mult. drill equipped with 14 spdles

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42 in. x 30 ft. **American** gd. bd. Q.C. lathe, la. typ.
36 in. x 22 ft. **Springfield** tr. gd. stand chg. lathe.
36 in. x 18 ft. **Lodge & Shipley** Q. C. lathe.
30 in. x 16 ft. **American** gd. bd. Q. C. lathe.
28 in. x 14 ft. **Lodge & Shipley** Q. C. lathe.
26 in. x 14 ft. **Gleason** std. chg. lathe, tap. attach.
24 in. x 12 ft. **American Tool Works** Q. C. lathe.
24 in. x 10 ft. **Greaves & Klusman** Q.C. lathe (l. t.)
21 in. x 12 ft. **LeBlond** gd. bd. Q.C. lathe (la. typ.).
20 in. x 11 ft. **Chard** Q. C. lathe, taper attach.
18 in. x 14 ft. **Johnson** gd. bd. Q. C. lathe, tap. att.
18 in. x 8 ft. **Monarch** Q. C. lathe.
16 in. x 8 ft. **Gr. & K.** gd. bd. Q.C. lathe, t. at. (l. t.)
16 in. x 8 ft. **Lodge & Shipley** sel.-gd. bd. Q.C. la.
16 in. x 6 ft. 16in. x 9 ft. **Hendey** yk. hd. Q.C. la., t. a
14 in. x 6 ft. **Amer.** hl.-du. gd. hd. Q.C. la. t. a., l. t.
No. 1-B **Foster** univ. turret lathe, air chucks.
21 and 13 in. **Gisholt** turret lathes, taper attach.
18 in. **Libbey** turret lathe Type "A", 3 ½-in. sp. hl.
No. 4 **Warner & Swasey** univ. turret lathe.
Nos. 2, 4 and 6 **Warner & Swasey** turret lathes.
No. 4 **Millholland** turret lathe, ca. 1 ½ in. thru. sp.

SHAPERS and PLANERS

26 in. **Smith & Mills** triple geared shaper.
24 in. **Gould & Eberhardt** B. G. crank shaper.
20 in. **Gould & Eberhardt** hi-du. B. G. crank shap.
16 in. **Hamilton** hvy. duty B. G. crank shaper.
16 in. **Keller** heavy duty B. G. crank shaper.
15 in. **Pratt & Whitney** crank shaper.
14 in. **Davis Mach. Co.'s** crank shaper.
24 x 24 in. x 8 ft. **Woodward & Powell** planer, 1 hd.
36 x 36 in. x 14 ft. **Amer. Tool Wks.** planer, 2 hds.

GEAR MACHINERY and GRINDERS

No. 12 **Barber-Colman** gear hobber.
No. 5-A **Lees-Bradner** gear hobber.
No. 18-H **Gould & Eberhardt** hi-duty gear hobber
6, 11 and 18 in. **Gleason** bevel generators.
No. 6 **Fellows** gear shapers.
No. 5, 48-in. & No. 3, 26-in. **B.&S.** aut. sp. gr. cut.
No. 2 **LaSalle** automatic surface grinder.
No. 3 **Wilmarth & Morman** auto surface grinder.
No. 22, 12-in. **Heald** rotary surface grinder.
Nos. 70 and 75 **Heald** internal grinders.
No. 60 **Heald** cylinder grinder.
No. 6, 26-in. and No. 8, 40-in. **Gardner** disc grind.
6x32, 10x24 and 10x36 in. **Norton** pl. grinders, l. t.
Nos. 2 and 3 **Brown & Sharpe** universal grinders.
No. 2 **Oakley** universal tool and cutter grinder.

MISCELLANEOUS

15 ton **Lucas** power forcing presses.
36 in. **Bullard** NEW ERA type vet. boring mill.
36 in. **Bullard** rap. prd. vt. bor. mill, tur. & sid. hd.
No. 9 **LeBlond** multi-cut lathes.
51 in. **Niles** vert. boring mill, two heads.
72 in. **Bickford** vert. boring mill, two heads.
Nos. 2 and 3 **J. N. La Pointe** dble. broach. mach.
1 ¼ and 2 in. **Landis** dble. spdle. bolt thread. mach.
No. 272, 72-in. **Niagara** pwr. sq. shear, cap. 14 ga.
Nos. 1 and 2 **Garvin** auto. tapping mach.
No. 0 **Mitts & Merrill** keyseater, cap. ¾ in. key.
Winfield elec. spot welder, cap. 2 pieces of ¼ in.

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Alloys, Special
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Union Twist Drill Co., Athol, Mass.
Westcott Chuck Co., Oneida, N. Y.
Whitney Mfg. Co., Hartford, Conn.

Babbitt
Magnolia Metal Co., N. Y.

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Davis Boring Tool Co., St. Louis

Bars, Boring, Expansion
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Bristol Co., Waterbury, Conn.

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Casler Herman, Canasota, N. Y.
Davis Boring Tool Co., St. Louis

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Sellers & Co., Wm., Philadelphia

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Link-Belt Co., Chicago

Buffing & Polishing Machines
(See Polishing & Buffing Machines)

Burners, Oil and Gas
Johnson Gas Appliance Co., Cedar Rapids, Iowa

Bushings
Ex-Cell-O Tool & Mfg. Co., Detroit

Bushings, Drill and Jig
Acme Industrial Co., Chicago
Ex-Cell-O Tool & Mfg. Co., Detroit

Calipers
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Cable, Insulated
Simplex Wire & Cable Co., Boston

Cabinets, Tool, Reamer & Drill, Steel
(See Furniture, Machine Shop)

Cam Cutting Machines
Rowbottom Mach. Co., Waterbury, Conn.

Cams
Hartford Special Machy. Co., Hartford
Rowbottom Mach. Co., Waterbury, Conn.

Carbonizing Machines
American Gas Furnace Co., Elizabeth, N. J.

Case Hardening and Tempering Compounds
Meisel Press Mfg. Co., Boston
Shore Instrument & Mfg. Co., Jamaica, N. Y.

Castings, Aluminum
Aluminum Co. of America, Pittsburgh
Metal & Alloy Specialties Co., Buffalo
Stewart Die Casting Corp., Chicago

Castings, Brass, Bronze & Copper
Metal & Alloy Specialties Co., Buffalo
Stewart Die Casting Corp., Chicago

Castings, Die Molded
Aluminum Co. of America, Pittsburgh
Milwaukee (Wis.) Die Casting Co.
Stewart Die Casting Corp., Chicago

Castings, Iron and Steel
Etna Machine Co., Toledo
Franklin Mach. Co., Providence.
Link-Belt Co., Chicago
Producto Machine Co., Bridgeport
Springfield (O.) Mach. Tool Co.
West Steel Casting Co., Cleveland

Castings, Nickel Monel
Metal & Alloy Specialties Co., Buffalo

Castings, Semi-Steel
Springfield (O.) Machine Tool Co.

Centering Machines
Hanson-Whitney Machine Co., Hartford
Niles-Bement-Pond Co., New York
Pratt & Whitney Co., Hartford
Sundstrand Mach. Tool Co., Rockford, Ill.
Whiton Mach. Co., D. E., New London, Conn.

Centers, Adjustable
Eclipse Interchangeable Counterbore Co., Detroit

Centers, Planer
Cincinnati (O.) Planer Co.

Chains (See Sprockets & Chains)

Chains, Driving
Boston Gear Works Sales Co., Quincy, Mass.
Link-Belt Co., Chicago
Philadelphia (Pa.) Gear Wks.
Whitney Mfg. Co., Hartford

Checks, Metal Trim and Tool
Noble & Westbrook Mfg. Co., Hartford

Chucking Machines
Bullard Mach. Tool Co., Bridgeport, Conn.
Cleveland (O.) Auto Mach. Co.
Goss & deLeeuw Mach. Co., New Britain, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Cleveland
New Britain Mach. Co., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.

Chucks, Air Operated
Logansport Machine Co., Logansport, Ind.
Skinner Chuck Co., New Britain, Conn.

Chucks, Automatic and Quick Changing
Errington Mech. Laboratory, Staten Island, N. Y.
Geometric Tool Co., New Haven, Conn.
Jarvis Co., Charles L., Gildersleeve, Conn.
Procunier Safety Chuck Co., Chicago
Skinner Chuck Co., New Britain, Conn.
Whitney Mfg. Co., Hartford

Chucks, Centering
Cushman Chuck Co., Hartford
Skinner Chuck Co., New Britain, Conn.
Westcott Chuck Co., Oneida, N. Y.

Chucks, Collet
Logansport Machine Co., Logansport, Ind.
Sundstrand Mach. Tool Co., Rockford, Ill.

Chucks, Drill and Tap
Cushman Chuck Co., Hartford
Errington Mech. Laboratory, Staten Island, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Procunier Safety Chuck Co., Chicago
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Westcott Chuck Co., Oneida, N. Y.
Whitney Mfg. Co., Hartford
Whiton Mach. Co., D. E., New London, Conn.

Chucks, Lathe
Bullard Mach. Tool Co., Bridgeport, Conn.
Casler, Herman, Canasota, N. Y.
Cushman Chuck Co., Hartford
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Westcott Chuck Co., Oneida, N. Y.
Whiton Mach. Co., D. E., New London, Conn.

Chucks, Magnetic
Arter Grinding Mach. Co., Worcester, Mass.
Heald Machine Co., Worcester, Mass.
Walker Co., O. S., Worcester, Mass.

Chucks, Planer
Cincinnati (O.) Planer Co.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Chucks, Split
Seneca Falls (N. Y.) Machine Co.
Stark Tool Co., Waltham, Mass.

Chucks, Vertical Boring Mill
Bullard Mach. Tool Co., Bridgeport, Conn.
Whiton Machine Co., D. E., New London, Conn.

Clamps, Machinists'
Armstrong Bros. Tool Co., Chicago
Reed Mfg. Co., Erie, Pa.
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste General
Oakite Products, Inc., N. Y.

Cleaning Machines, Metal Parts
Colts Patent Fire Arms Mfg. Co., Hartford

Clutches, Friction
Brown Co., A. & F., Elizabethport, N. J.
Brown Eng. Co., Reading, Pa.
Cutler-Hammer Mfg. Co., Milwaukee
Dodge Mfg. Corp., Mishawaka, Ind.
Foote Bros. Gear & Mach. Co., Chicago
Hill-Clutch Machine & Fdry. Co., Cleveland
Johnson Machine Co., Carlyle, Manchester, Conn.
Jones Fdry. & Machine Co., W. A., Chicago
Link-Belt Co., Chicago
Moore & White Co., Philadelphia
Raybestos Co., Bridgeport Conn.

Coal and Ash Handling Machinery
Link-Belt Co., Chicago
Shepard Elect. Crane & Hoist Co., Montour Falls, N. Y.

Coal Storage Systems
Link-Belt Co., Chicago

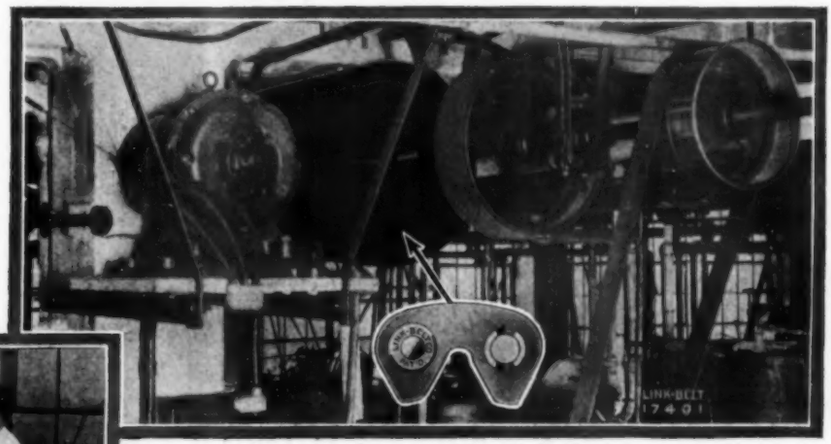
Collars, Shaft or Set
Dodge Mfg. Co., Mishawaka, Ind.

Collars, Spacing
Detroit (Mich.) Stamping Co.

Collets
Brown & Sharpe Mfg. Co., Providence
Geometric Tool Co., New Haven, Conn.

Compensators, Motor Starting
Hardinge Brothers, Chicago
Rivett Lathe & Grinder Corp., Boston
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

USED IN LAUNDRIES TOO!



Excelsior Laundry Co., of Indianapolis, have 10 Link-Belt Silent Chain Drives in Operation

HERE is what they say about them: "In the four years these drives have been operating, they have never been shut down during working hours, and have never cost us one cent for repairs. They seem to be in as good condition as when originally installed.

"We believe that Link-Belt Silent Chain Drives are especially well adapted to laundry service, both on lineshafts and to drive individual machines. We are very much pleased with the installations and are glad to recommend them."

A large saving in cost was effected by using standard high speed motors and large reduction Link-Belt Silent Chain Drives instead of back-geared motors.

Send for a copy of Data Book No. 125.

LINK-BELT COMPANY 3558

Leading Manufacturers of Elevating, Conveying, and Power Transmission Chains and Machinery

CHICAGO 300 W. Pershing Rd. INDIANAPOLIS, P. O. Box 85. PHILADELPHIA, 2045 W. Hunting Park Ave. SAN FRANCISCO, 19th and Harrison Sts.

Ashland, Ky.	Birmingham	Charlotte	Dallas	Grand Rapids	Los Angeles	Minneapolis	New York	Portland, Ore.	Toronto
Atlanta	Boston	Cincinnati	Denver	Huntington, W.Va.	Louisville	Montreal	Oakland	Seattle	Utica, N. Y.
Baltimore	Buffalo	Cleveland	Detroit	Kansas City, Mo.	Milwaukee	New Orleans	Pittsburgh	St. Louis	Wilkes-Barre

LINK-BELT SILENT CHAIN DRIVES

Compounds, Cleaning
Oakite Products, N. Y.

Compounds, Cutting, Drawing, Drilling Grinding and Screw Cutting
Oakite Products, N. Y.

Compounds, Resin
Formica Insulation Co., Cincinnati

Compressors, Air & Gas
Quincy Compressor Co., Quincy, Ill.

Contract Work
American Car & Foundry Co., N. Y.
American Metal Treatment Co., Elizabeth, N. J.
Brown & Sharpe Mfg. Co., Providence
Columbus (O.) Die T. & M. Co.
Detroit (Mich.) Stamping Co.
Efficient Machine Shop, New York
Franklin Machine Co., Providence
Hartford Special Machy. Co., Hartford
Huhn Mfg. Co., Highbridge, N. Y.
Keller Mechr. Engr. Corp., Brooklyn
Krasberg Tool & Mfg. Co., Chicago
Lincoln Mach. Co., Pawtucket, R. I.
Mehl Mach. Tool & Die Co., Roselle, N. J.
Meisel Press Mfg. Co., Boston.
Niles Tool Works, Hamilton, O.
Precision Engr. Co., Phila.
Producto Machine Co., Bridgeport, Conn.
Rogers, Dayton A., Minneapolis
Simplex Tool Co., Woonsocket, R. I.
Waltham (Mass.) Mach. Wks.
White Dental Mfg. Co., S. S., N. Y.

Controllers & Starters, Electric
Cutler-Hammer Mfg. Co., Milwaukee
Union Electric & Mfg. Co., Milwaukee

Conveyors
Dodge Mfg. Co., Mishawaka, Ind.
Link-Belt Co., Chicago
Standard Conveyor Co., No. St. Paul, Minn.

Counterbores
Cleveland (O.) Twist Drill Co.
Pratt & Whitney Co., Hartford

Counters, Revolution
Bristol Co., Waterbury, Conn.
Veeder-Root, Hartford

Countershafts
Dodge Mfg. Corp., Mishawaka, Ind.
Greenfield (Mass.) Tap & Die Corp.
Standard Pressed Steel Co., Jenkintown, Pa.

Counting Machines
Veeder-Root, Hartford

Couplings, Flexible
Brown Eng. Co., Reading, Pa.
Boston Gear Works Sales Co., Quincy, Mass.
Foote Bros. Gear & Mach. Co., Chicago
Hill-Clutch Machine & Fdry. Co., Cleveland
Jones Fdry. & Machine Co., W. A., Chicago
Morrison Mach. Co., Paterson, N. J.
Nicholson & Co., W. H., Wilkes-Barre
Philadelphia (Pa.) Gear Wks.

Couplings, Shaft
Johnson Mach. Co., Carlyle, Manchester, Conn.
Link-Belt Co., Chicago
Morrison Mach. Co., Paterson, N. J.

Cranes, Locomotive & Crawler
Link-Belt Co., Chicago

Cranes, Traveling
Shaw Crane-Putnam Mach. Co., Inc., Fitchburg, Mass.
Shephard Electric Crane & Hoist Co., Montour Falls, N. Y.

Crank Pin Turning Machines
Niles-Bement-Pond Co., New York

Crankshaft-Lapping Machines
Norton Co., Worcester, Mass.

Cutters, Gear
Brown & Sharpe Mfg. Co., Providence
National Twist D. & T. Co., Detroit
O. K. Tool Co., Shelton, Conn.
Union Twist Drill Co., Athol, Mass.

Cutters, Keyseater
Davis Keyseater Co., Rochester

Cutters, Milling
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence
Butterfield & Co., Derby Line, Vt.
Geometric Tool Co., New Haven, Conn.
Ingersoll Milling Mach. Co., Rockford, Ill.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist D. & T. Co., Detroit
O. K. Tool Co., Shelton, Conn.
Pratt & Whitney Co., Hartford
Producto Machine Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Co., Hartford

Cutting-Off Machines
Atkins & Co., E. C., Indianapolis
Brown & Sharpe Mfg. Co., Providence
Etna Machine Co., Toledo, O.
Gorton Mach. Co., Geo. , Racine, Wis.
Landis Machine Co., Waynesboro, Pa.

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., Hartford

Dealers, Machinery
(See Searchlight Section)
Brownell Machy. Co., Providence
Eastern Machinery Co., Cincinnati
Hill, Clarke & Co., Chicago
Miles Machy. Co., Saginaw
Monarch Machine Tool Co., Sidney, O.
Morey & Co., N. Y.
Oesterlein Machine Co., Cincinnati
Osborne & Sexton Mchy. Co.,
Reed-Prentice Corp., Worcester, Mass.
Ryerson & Son, Jos. T., Chicago
Shaw-Crane-Putnam Machine Co., Fitchburg, Mass.
Simmons Machine Tool Co., Albany
Smith Mchy. Co., H. A., Syracuse
Taylor-Hall Welding Corp., Worcester, Mass.

Demagnetizers
O. S. Walker Co., Worcester, Mass.

Diamond Tools
Desmond-Stephan Mfg. Co. Urbana, O.
Dickinson, Thomas L., N. Y.

Die Cutting Machines, Auto.
Keller Mech. Engr. Corp., Brooklyn

Die Holders for Presses
Producto Machine Co., Bridgeport, Conn.
U. S. Tool Co., Ampere, N. J.

Die Makers Supplies
Danly Mach. Spec., Inc., Chicago
White Dental Mfg. Co., S. S., N. Y.

Die Making Machines
Haskins Co., R. G., Chicago
Keller Mech. Engr. Corp., Brooklyn
White Dental Mfg. Co., S. S., N. Y.

Die Sets
Baumbach Mfg. Co., E. A., Chicago
Danly Mach. Spec., Inc., Chicago

Dies, Forging
Butterfield & Co., Derby Line, Vt.
Keller Mech. Engr. Corp., Brooklyn

Dies, Self-Opening, Adjustable
Cons. Mach. Tool Corp., Rochester
Eastern Mach. S. Corp., New Haven.
Geometric Tool Co., New Haven, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mach. Co., Waynesboro, Pa.
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland

Dies, Sheet and Sub Press
(See Contract Work)

Dies, Steel Marking
Noble & Westbrook Mfg. Co., Hartford

Dies, Thread-Opening
Eastern Mach. S. Corp., New Haven
Geometric Tool Co., New Haven, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mach. Co., Waynesboro, Pa.
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland
National Machinery Co., Tiffin, O.

Dividing Heads
Carl Zeiss, (Geo. Scherr Co.), N. Y.
U. S. Mach. Tool Co., Cincinnati

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago
West Steel Casting Co., Cleveland

Drafting Materials
Shaw Blue Print Machine Co., Newark, N. J.

Dressers, Grinding Wheel
Bay State Stamp Co., Worcester
Desmond-Stephan Mfg. Co. Urbana, O.
Norton Co., Worcester, Mass.

Drill Holders
Armstrong Bros. Tool Co., Chicago.

Drill Speeders
Graham Mfg. Co., Providence

Drilling Machine Heads
Langelier Mfg. Co., Cranston, R. I.
Rockford (Ill.) Drilling Machine Co.
U. S. Drill Head Co., Cincinnati

Drilling Machines, Automatic
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Detroit Machine Tool Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.
Rockford (Ill.) Drilling Machine Co.

Drilling Machines, Bench
Ames Co., B. C., Waltham, Mass.
Barnes Co., W. F. & John, Rockford, Ill.
Canedy-Otto Mfg. Co., Chicago Hts., Ill.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Rockford (Ill.) Drilling Mach. Co.

Drilling Machines, Gang
Baker Bros., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Chicago Pneumatic Tool Co., New York
Cincinnati Bickford Tool Co., Cincinnati
Foote-Burt Co., Cleveland
Hoefer Mfg. Co., Freeport, Ill.
Rockford Drilling Machine Co., Rockford, Ill.

Drilling Machines, Heavy Duty
Barnes Co., W. F., & John, Rockford, Ill.
Barnes Drill Co., Inc., Rockford, Ill.
Cons. Mach. Tool Corp., Rochester
Foote-Burt Co., Cleveland
Minster Machine Co., Minster, O.
Niles-Bement-Pond Co., New York
Rockford (Ill.) Drilling Machine Co.

Drilling Machines, Horizontal
(See Boring, Drilling & Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Baker Bros., Toledo, O.
Barnes Co., W. F., & John, Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Cons. Mach. Tool Corp., Rochester
Detroit Machine Works, Detroit
Foote-Burt Co., Cleveland
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Harrington Co., Philadelphia
Kingsbury Mach. Tool Corp., Keene, N. H.
Langelier Mfg. Co., Cranston, R. I.
Moline (Ill.) Tool Co.
Pratt & Whitney Co., Hartford
Rockford (Ill.) Drilling Mach. Co.
Sellers & Co., Wm., Philadelphia

Drilling Machines, Radial
American Tool Wks. Co., Cincinnati
Carlton Machine Tool Co., Cincinnati
Cincinnati (O.) Bickford Tool Co.
Dreses Mch. T. Co., Cincinnati
Harrington Co., Philadelphia
Morris Mach. Tool Co., Cincinnati
Niles-Bement-Pond Co., New York
Reed-Prentice Corp., Worcester, Mass.
Sellers & Co., Wm., Philadelphia

Drilling Machines, Semi-Automatic
Detroit Machine Tool Co., Detroit

Drilling Machines, Sensitive
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo (N. Y.) Forge Co.
Canedy-Otto Mfg. Co., Chicago Hts., Ill.
Demco, Division of Merit Equipment Corp., Cleveland
Hardinge Brothers, Chicago
High Speed Hammer Co., Rochester, N. Y.
Kingsbury Mach. Tool Corp., Keene, N. H.
Langelier Mfg. Co., Cranston, R. I.
Leland-Gifford Co., Worcester, Mass.
Taylor & Fenn Co., Hartford, Conn.
U. S. Mch. Tool Co., Cincinnati
Wisconsin Elec. Co., Racine, Wis.

Drilling Machines, Vertical
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Inc., Rockford, Ill.
Canedy-Otto Mfg. Co., Chicago Hts., Ill.
Cincinnati (O.) Bickford Tool Co.
Demco, Division of Merit Equipment Corp., Cleveland
Foote-Burt Co., Cleveland
Harrington Co., Philadelphia
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Niles-Bement-Pond Co., New York
Rockford (Ill.) Drilling Mach. Co.

Drills, Center
Cleveland (O.) Twist Drill Co.
Demco, Division of Merit Equipment Corp., Cleveland
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.

Drills, Core
Eclipse Interchangeable Counterbore Co., Detroit

Drills, Portable, Elec. and Pneumatic
Clark Electric Co., Jas., Jr., Louisville, Ky.
Standard Elect. Tool Co., Cincinnati
Wisconsin Elec. Co., Racine, Wis.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., Hartford
Union Twist Drill Co., Athol, Mass.

Drills, Twist and Flat
Butterfield & Co., Derby Line, Vt.
Cleveland (O.) Twist Drill Co.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol, Mass.

Drying Machines, Metal Parts
Colts Patent Fire Arms Mfg. Co., Hartford

Electrical Supplies
Cutler-Hammer Mfg. Co., Milwaukee
Simplex Wire & Cable Co., Boston

Elevator Trucks
(See Trucks)

Elevators and Conveyors
Dodge Mfg. Co., Mishawaka, Ind.
Link-Belt Co., Chicago

Engraving Machinery
Gorton Mach. Co., Geo., Racine, Wis.

Extractors Oil
Barrett Leon J., Worcester, Mass.
Shaw Crane-Putnam Mach. Co., Inc., Fitchburg, Mass.

Facing Machines
Preis & Co. H. P., Newark, N. J.

Fans, Electric
Buffalo (N.Y.) Forge Co.

Files, Precision
American Swiss File & Tool Co., Elizabeth, N. J.

Files and Rasps
Arion Steel Co., Boston
Atkins & Co., E. C., Indianapolis

Filing Machines
Ames Co., B. C., Waltham, Mass.
Atkins & Co., E. C., Indianapolis
Haskins Co., R. G., Chicago
Oliver Instrument Co., Adrian, Mich.
White Dental Mfg. Co., S. S., N. Y.

Filler, Iron (See Cements, Iron)

Fittings, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Filters, Oil
Bowser & Co., S. F., Fort Wayne, Ind.

Flexible Shaft Equipment
Keller Mech. Engr. Corp., Brooklyn

Forging Machinery
Acme Mchy. Co., Cleveland
National Mchy. Co., Tiffin, O.

Forgings, Drop
Gears & Forgings, Inc., Cleveland

Forgings, Flat Die
Gears and Forgings, Inc., Cleveland

Forgings, Weldless Rings
Gears and Forgings, Inc., Cleveland

Furnaces, Forging
American Gas Furnace Co., Elizabeth, N. J.
Strong, Carlisle & Hammond Co., Cleveland

Furnaces, Heat Treating, Oil and Gas
Johnson Gas Appliance Co., Cedar Rapids, Iowa

Furnaces, Heat Treating, Tempering and Annealing
American Gas Furnace Co., Elizabeth, N. J.
Brown & Sharpe Mfg. Co., Providence
Johnson Gas Appliance Co., Cedar Rapids, Iowa
Strong Carlisle & Hammond Co., Cleveland

Furnaces, Oil & Gas
Strong, Carlisle & Hammond Co., Cleveland

Furniture, Machine Shop
Brown Eng. Co., Reading, Pa.
New Britain Mach. Co., New Britain, Conn.

Gage Blocks
Pratt & Whitney Co., Hartford
Standard Gage Co., Inc., Poughkeepsie, N. Y.

Gages, Comparator
Federal Products Corp., Providence
Jones & Lamson Mch. Co., Springfield, Vt.

Gages, Dial
Ames, Co., B. C., Waltham, Mass.
Federal Products Corp., Providence
Lowe, Henry E., Cleveland
Starrett Co., L. S., Athol, Mass.

Gages, Plug and Ring
Brown & Sharpe Mfg. Co., Providence
Hanson-Whitney Machine Co., Hartford
Pratt & Whitney Co., Hartford
Standard Gage Co., Inc., Poughkeepsie, N. Y.

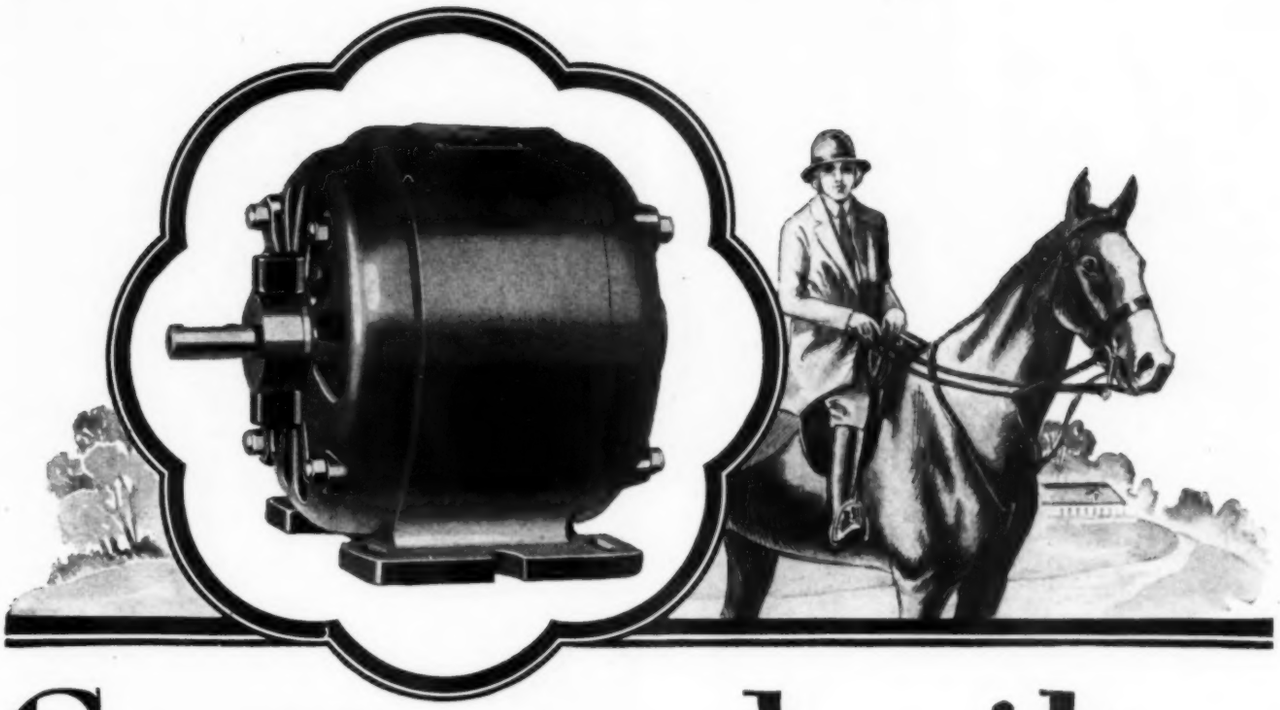
Gages, Recording
Bristol Co., Waterbury, Conn.

Gages, Snap, Thread and Cylindrical
Brown & Sharpe Mfg. Co., Providence
Federal Products Corp., Providence
Hanson-Whitney Machine Co., Hartford
Pratt & Whitney Co., Hartford
Standard Gage Co., Inc., Poughkeepsie, N. Y.

Gages, Standard
Federal Products Corp., Providence
Hanson-Whitney Machine Co., Hartford
Pratt & Whitney Co., Hartford
Standard Gage Co., Inc., Poughkeepsie, N. Y.

Gear Blanks, Composition
Formica Insulation Co., Cincinnati

Gear Cutting Machinery
Adams Co., Dubuque, Iowa



Custom built –

Copper, Iron plus insulation—these are the principal raw materials that make up a Motor.

Naturally the quality of these materials is of first consideration in producing a good Motor. That is why all raw materials for Ohio Motors must pass such rigid specifications.

With good raw materials as a basis, each machining operation of Ohio Motor parts must meet an accuracy of plus or minus a few ten thousandths of an inch.

Even with this combination of good raw materials and accurate assembly operations, each Ohio Motor must pass a series of 14 individual tests before it is approved for shipment.

True, such a Custom Built Motor costs slightly more than an average Motor. However, the long list of satisfied Ohio Motor Users is the most convincing argument that this Quality in Motors is well worth the price.

What Users Say:

Mr. Hugh E. Brown of The W. S. Tyler Company writes:

"We have used Ohio Fractional Horse-Power Motors for a good many years. These are applied on our testing sieve shakers, a machine which calls for a heavy starting torque, and because this machine is used in laboratories, it is subjected to considerable dust and general abuse."

"The Ohio Motors have given such splendid service that we feel nothing we could say would do justice to their wonderful performance."

NOTE:—These machines, Ohio Motor equipped are shipped all over the world.

Ohio Motors meet all N.E.M.A. and N.E.L.A. specifications.
1/20 to 1/4 Horse Power

OHIO reliable MOTORS

THE OHIO ELECTRIC & CONTROLLER COMPANY
5903 Maurice Avenue, Cleveland, Ohio

OHIO MOTORS

Barber-Colman Co., Rockford, Ill.
Bilgram Machine Works, Phila.
Brown & Sharpe Mfg. Co., Providence
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Harrington Co., Philadelphia
Newark (N. J.) Gear Cut Mch. Co.
Producto Machine Co., Bridgeport
Schuchardt & Schutte (Geo. Scherr Co., N. Y.
Waltham (Mass.) Machine Works
Whiton Mch. Co., D. E., New London, Conn.

Gear Tempering Machinery
Gleason Works, Rochester, N. Y.

Gear Testing Machinery
Adams Co., Dubuque, Iowa
Gleason Works, Rochester, N. Y.
Newark (N. J.) Gear Cut. Mch. Co.

Gears, Cast
Brown Co., A. & F., Elizabethport, N. J.
Dodge Mfg. Co., Mishawaka, Ind.
Hartford Special Machy. Co., Hartford
Link-Belt Co., Chicago
Philadelphia (Pa.) Gear Works
Sier-Bath Co., New York

Gears, Cut
Adams Co., Dubuque, Iowa
Atlantic Gear Works, Brooklyn
Bilgram Machine Works, Phila.
Boston Gear Works Sales Co., Quincy, Mass.
Brown & Sharpe Mfg. Co., Providence
Brown Co., A. & F., Elizabethport, N. J.
Cincinnati Gear Co., Cincinnati
Diefendorf Gear Corp., Syracuse
Earle Gear & Mch. Co., Philadelphia
Fellows Gear Shaper Co., Springfield, Vt.
Foote Bros. Gear & Mach. Co., Chicago
Gears & Forgings, Inc., Cleveland
Gleason Works, Rochester, N. Y.
Grant Gear Works, Boston
Hartford Special Machy. Co., Hartford
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Machine Co., W. A., Chicago
Link-Belt Co., Chicago
Meisel Press Mfg. Co., Boston
Niles-Bement-Pond Co., New York
Nuttall Co., R. D., Pittsburgh
Philadelphia (Pa.) Gear Works
Sier-Bath Co., N. Y.
Simonds Mfg. Co., Pittsburgh

Gears, Forged
Gears & Forgings, Inc., Cleveland
Grant Gear Works, Boston
Hartford Special Machy. Co., Hartford
Horsburgh & Scott Co., Cleveland
Philadelphia (Pa.) Gear Wks.

Gears, Speed Reducing
Boston Gear Works Sales Co., Quincy, Mass.
Bridgeport Motor Co., Bridgeport, Conn.
Dodge Mfg. Co., Mishawaka, Ind.
Earle Gear & Mach. Co., Phila.
Foote Bros. Gear & Mach. Co., Chicago
Gears & Forgings, Inc., Cleveland
Grant Gear Works, Inc., Boston
Hartford (Conn.) Special Machy. Co
Horsburgh & Scott Co., Cleveland
Morrison Mach. Co., Paterson, N. J.
Philadelphia (Pa.) Gear Works

Generators, Electric
Reliance Elect. & Eng. Co., Cleveland

Grease, Cups
Alemite Mfg. Corp., Chicago

Grease, Guns
Alemite Mfg. Corp., Chicago

Grinding Machines, Ball Bearing Race
(See Grinding Machines, Radial)

Grinding Machines, Bench
Blount Co., J. G., Everett, Mass.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Haskins Co., R. G., Chicago
Marschke Mfg. Co., Indianapolis
Norton Co., Worcester, Mass.
Union Twist Drill Co., Athol, Mass.
Walker Co., O. S., Worcester, Mass.

Grinding Machines Centerless
Cincinnati (O.) Milling Mach. Co.

Grinding Machines, Chaser
Geometric Tool Co., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland

Grinding Machines, Chuck
Blanchard Mach. Co., Cambridge
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Cutter and Reamer
Barber-Colman Co., Rockford, Ill.
Barnes Co., W. F. & John, Rockford, Ill.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Fafnir Bearing Co., New Britain, Conn.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.
Reed-Prentice Corp., Worcester, Mass.
Sellers & Co., Wm., Philadelphia
Taylor & Fenn Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.
Walker Co., O. S., Worcester, Mass.

Grinding Machines, Cylinder
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

Grinding Machines, Cylindrical
Arter Grinding Mach. Co., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Grinders Co.
Cons. Mach. Tool Corp., Rochester
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder Corp., Boston
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Die
Abrasive Mch. T. Co., E. Providence
Bignall & Keeler Mach. Wks., Edwardsville, Ill.
Blanchard Mach. Co., Cambridge, Mass.
Geometric Tool Co., New Haven, Conn.
Heald Machine Co., Worcester, Mass.
Landis Machine Co., Waynesboro, Pa.
Murchey Mach. & Tool Co., Detroit
National Machinery Co., Tiffin, O.
Walker Co., O. S., Worcester, Mass.

Grinding Machines, Drill and Tap
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Sellers & Co., Wm., Philadelphia

Grinding Machines, Face or Ring Wheel
Abrasive Mch. T. Co., E. Providence
Blanchard Mach. Co., Cambridge, Mass.
Graham Mfg. Co., Providence
Walker Co., O. S., Worcester

Grinding Machines, Flexible Shaft
Keller Mech. Engr. Co., Brooklyn

Grinding Machines, Floor
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence
Diamond Mach. Co., Providence
Marschke Mfg. Co., Indianapolis
Norton Co., Worcester, Mass.
Walker Co., O. S., Worcester, Mass.

Grinding Machines, Gage
Abrasive Mch. T. Co., E. Providence
Landis Tool Co., Waynesboro, Pa.

Grinding Machines, Head & End
Arter Grinding Mach. Co., Worcester, Mass.

Grinding Machines, Hob
Schuchardt & Schutte (Geo. Scherr Co.), New York

Grinding Machines, Internal
Cincinnati Grinders, Cincinnati
Heald Mach. Co., Worcester, Mass.
Hjorth Lathe & Tool Co., Boston
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder Corp., Boston
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.

Grinding Machines, Piston Ring
Arter Grinding Mach. Co., Worcester, Mass.
Heald Machine Co., Worcester, Mass.

Grinding Machines, Portable
Clark Electric Co., Jas., Jr., Louisville, Ky.
Haskins Co., R. G., Chicago
Standard Elect. Tool Co., Cincinnati
Van Dorn Electric Tool Co., Cleveland
Wisconsin Elec. Co., Racine, Wis.
White Dental Mfg. Co., S. S., N. Y.

Grinding Machines, Pulley
Graham Mfg. Co., Providence

Grinding Machines, Radial
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Snagging
Diamond Mach. Co., Providence
Marschke Mfg. Co., Indianapolis

Grinding Machines, Surface
Abrasive Mch. T. Co., E. Providence
Arter Grinding Mach. Co., Worcester, Mass.
Blanchard Mach. Co., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence
Heald Mach. Co., Worcester, Mass.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Hartford
Walker Co., O. S., Worcester, Mass.

Grinding Machines, Swing Frame
Marschke Mfg. Co., Indianapolis

Grinding Machines, Tappet & Valves
Fitchburg Grinding Mach. Co., Fitchburg, Mass.

Grinding Machines, Tool
Sellers & Co., Wm., Philadelphia

Grinding Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati Grinders, Cincinnati
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

Grinding Wheels
Atkins & Co., E. C., Indianapolis
Norton Co., Worcester, Mass.
Vitrified Wheel Co., Westfield, Mass.

Guns
Spraco Painting Equipment Co., Boston

Hammers, Power
Bliss Co., E. W., Brooklyn, N. Y.
High Speed Hammer Co., Rochester, N. Y.
Niles-Bement-Pond Co., New York
Ohio Electric Co. & Controller Co.,
Sutton Engineering Co., Pitts. Pa.

Hammers, Soft Metal
Producto Machine Co., Bridgeport

Hammers, Steam
Sellers & Co., Wm., Philadelphia

Hangers, Shaft
American Pulley Co., Phila
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
Jones Fdry. & Machine Co., W. A. Chicago
S. K. F. Industries, Inc., New York
Standard Pressed Steel Co., Jenkintown, Pa.

Hardness Measuring Instruments, Steel
Rockwell Co., Stanley P., Hartford, Conn.
Shore Instrument & Mfg. Co., Jamaica, N. Y.

Heat Treating Instruments
Rockwell Co., Stanley P., Hartford, Conn.

Heaters, Rivet
American Car & Foundry Co., N. Y.
American Gas Furnace Co., Elizabeth, N. J.
Buffalo (N. Y.) Forge Co.

Hobbing Machines
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence
Newark (N. J.) Gear Cutting Mch. Co.
Schuchardt & Schutte (Geo. Scherr Co.), New York

Hobs
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence
Hanson-Whitney Machine Co., Hartford
National Twist D. & T. Co., Detroit
Philadelphia (Pa.) Gear Wks.
Union Mfg. Co., New Britain, Conn.

Hoists, Chain
Union Twist Drill Co., Athol, Mass.

Hoists, Electric
Harrington Co., Philadelphia

Hoists, Hand
Harrington Co., Philadelphia

Hoists & Cranes, Elect. & Traveling
Shepard Elect. Crane & Hoist Co., Montour Falls, N. Y.

Honing Machines
Barnes Drill Co., Rockford, Ill.

Hydraulic Machinery
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Indicators
Lowe, Henry E., Cleveland

Indicators, Speed and Test
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.
Veeder-Root, Hartford

Jacks, Planer
Armstrong Bros. Tool Co., Chicago

Jig Bushings
Acme Industrial Co., Chicago

Jigs
Siewek Tool & Die Co., Detroit
Jigs & Fixtures
(See Contract Work)

Joints, Universal
Boston Gear Works Sales Co., Quincy, Mass.
Gray & Prior Mach. Co., Hartford

Kettles, Soda
Gray & Prior Mach. Co., Hartford

Keyseating Machines
Baker Bros., Toledo, O.
Davis Keyseater Co., Rochester
Lapointe Mach. Tool Co., Hudson, Mass.
Lapointe Co., J. N., New London, Conn.
Mitts & Merrill, Saginaw, Mich.

Keys, Machine
Whitney Mfg. Co., Hartford, Conn.

Lace, Leather
Rhoads & Sons, J. E., Philadelphia

Lapping Machines, Cylindrical and Flat
Norton Co., Worcester, Mass.

Lathe Attachments
Flather Co. (The) Nashua, N. H.
South Bend (Ind.) Lathe Works

Lathe Tools
Armstrong Bros. Tool Co., Chicago
O.K. Tool Co., Shelton, Conn.

Lathes, Automatic and Semi-Automatic
Bullard Mach. Tool Co., Bridgeport
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Cleveland
Potter & Johnston Mch. Co., Pawtucket
Pratt & Whitney Co., Hartford
Reed-Prentice Corp., Worcester, Mass.
Seneca Falls (N. Y.) Machine Co.
Steinle Turret Mach. Co., Madison, Wis.
Sundstrand Mach. Tool Co., Rockford, Ill.

Lathes, Axle
Sellers & Co., Wm., Philadelphia

Lathes, Bed Gap
South Bend (Ind.) Lathe Works

Lathes, Bench
Ames Co., B. C., Waltham, Mass.
Blount Co., J. G., Everett, Mass.
Dalton Tool & Mach. Corp., New York
Hardinge Brothers, Chicago
Hjorth Lathe & Tool Co., Boston
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Corp., Boston
Seneca Falls (N. Y.) Machine Co.
South Bend (Ind.) Lathe Works
Stark Too Co., Waltham, Mass.
Van Norman Mach. Tool Co., Springfield, Mass

Lathes, Boring
Niles-Bement-Pond Co., New York
Potter & Johnston Mch. Co., Pawtucket, R. I.
Shaw Crane-Putnam Mach. Co., Inc., Fitchburg, Mass.
Sundstrand Mach. Tool Co., Rockford, Ill.

Lathes, Car Wheel
Sellers & Co., Wm., Philadelphia

Lathes, Chucking
(See Lathes, Horizontal & Vertical Turret)

Lathes, Engine
American Tool Wks. Co., Cincinnati
Boye & Emmes Machine Tool Co., Cincinnati
Flather Co. (The) Nashua, N. H.
Cons. Mach. Tool Corp., Rochester
Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.
Greaves, Klusman Tool Co., Cincinnati
Hendey Machine Co., Torrington, Conn.
Lodge & Shipley Mach. Tool Co., Cincinnati
Monarch Mach. Tool Co., Sidney, O.
Morris Machine Tool Co., Cincinnati
Niles-Bement-Pond Co., New York
Porter-McLeod Mach. Tool Co., Hatfield, Mass.
Pratt & Whitney Co., Hartford
Reed-Prentice Corp., Worcester, Mass.
Seneca Falls (N. Y.) Machine Co
Shaw Crane-Putnam Mach. Co., Inc., Fitchburg, Mass.
South Bend (Ind.) Lathe Works
Sundstrand Mach. Tool Co., Rockford, Ill.
Springfield (O.) Mch. Tool Co.
Wickes Bros., Saginaw, Mich.

Lathes, Extension and Gap
American Tool Wks. Co., Cincinnati
Harrington Co., Philadelphia

Lathes, Horizontal and Vertical Turret
Acme Machine Tool Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence
Bullard Mach. Tool Co., Bridgeport
International Mach. Tool Co., Indianapolis
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Co., Hartford
Steinle Turret Mach. Co., Madison, Wis.

Lathes, Locomotive Driving Wheel
Sellers & Co., Wm., Philadelphia

Lathes, Polishing
(See Polishing & Buffing)

Lathes, Spinning
Adriance Mach. Wks., Brooklyn

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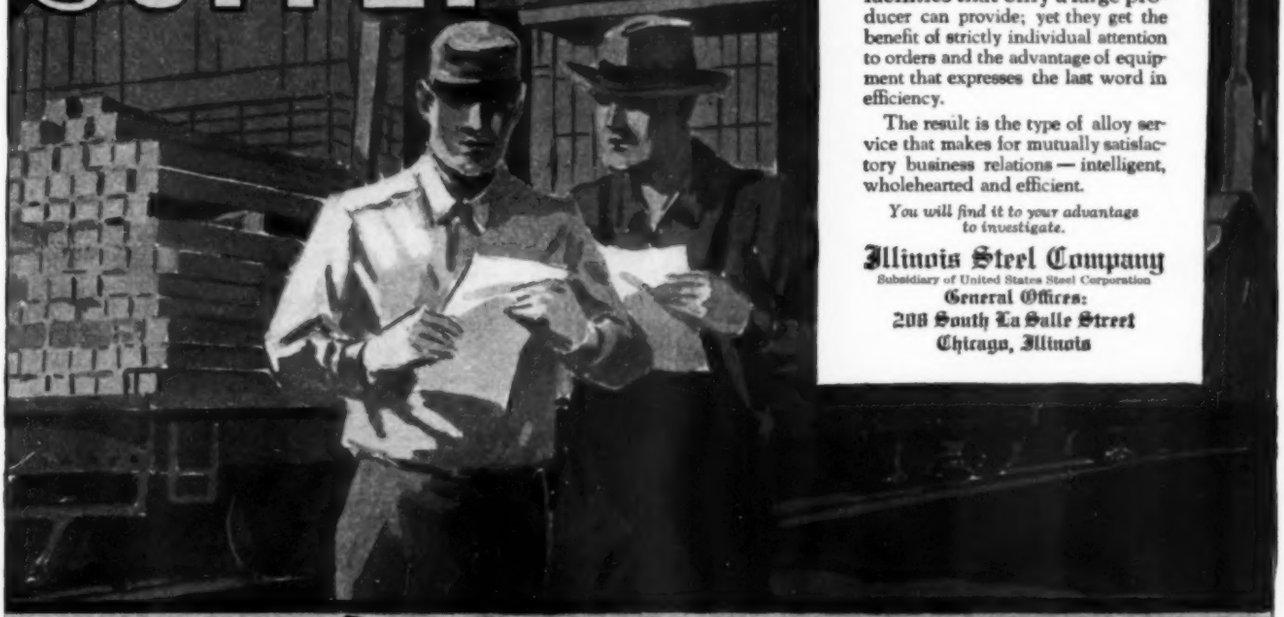

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Hardinge Brothers, Chicago
Lodge & Shipley Mach. Tool Co., Cincinnati
Porter-McLeod Mach. Tool Co., Hatfield, Mass.
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Corp., Boston
Shaw Crane-Putnam Mach. Co., Inc., Fitchburg, Mass.
South Bend (Ind.) Lathe Works
Sundstrand Mach. Tool Co., Rockford, Ill.

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Pratt & Whitney Co., Hartford
Universal Bor. Mach. Co., Hudson

Lining, Brake & Clutch
Raybestos Co., Bridgeport

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Alemite Mfg. Corp., Chicago
Oakite Products, N. Y.

Lubricating Systems
Alemite Mfg. Corp., Chicago
Bowser & Co., S. F., Fort Wayne.

Lubricants, Force-feed
Bowser & Co., S. F., Fort Wayne.

Machinists' Small Tools
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Magnets, Lifting
Cutler-Hammer Mfg. Co., Milwaukee
Ohio Electric & Controller Co., Cleveland

Mandrels, Expanding
Nicholson & Co., W. H., Wilkes-Barre

Mandrels, Expanding, Air Operated
Logansport Machine Co., Logansport, Ind.

Mandrels, Solid
Pratt & Whitney Co., Hartford
Union Twist Drill Co., Athol, Mass.

Marking Devices
(See Stamps, Steel)

Marking Machines
Noble & Westbrook Mfg. Co., Hartford
Preis & Co., H. P., Newark, N. J.

Measuring Machines
Carl Zeiss, (Geo. Scherr Co.), N. Y.
Hanson-Whitney Machine Co., Hartford
Pratt & Whitney Co., Hartford

Meters, Fuel Oil
Bowser & Co., S. F., Fort Wayne.

Meters—Positive Displacement (Liquid)
Bowser & Co., S. F., Fort Wayne.

Micrometers, Bench
Pratt & Whitney Co., Hartford
Starrett Co., L. S., Athol, Mass.

Micrometer Calipers
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Milling Attachments
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker, Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Potter & Johnston Mch. Co., Pawtucket, R. I.
Producto Machine Co., Bridgeport
Reed-Prentice Corp., Worcester, Mass.
Sundstrand Mach. Tool Co., Rockford, Ill.
Whitney Mfg. Co., Hartford, Conn.

Milling Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Ingersoll Milling Mach. Co., Rockford, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., Hartford
Producto Machine Co., Bridgeport
Sundstrand Mach. Tool Co., Rockford, Ill.

Milling Machines, Bench
Ames Co., B. C., Waltham, Mass.
Hardinge Brothers, Chicago
Pratt & Whitney Co., Hartford
Stark Tool Co., Waltham, Mass.
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Continuous
Cons. Mach. Tool Corp., Rochester
Ingersoll Milling Mach. Co., Rockford, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
Potter & Johnston Mch. Co., Pawtucket, R. I.
Producto Machine Co., Bridgeport
Sundstrand Mach. Tool Co., Rockford, Ill.

Milling Machines, Duplex
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Ingersoll Milling Mach. Co., Rockford, Ill.
Producto Machine Co., Bridgeport
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Floor Plate
Sellers & Co., Wm., Philadelphia

Milling Machines, Hand
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Rockford, Ill.
Pratt & Whitney Co., Hartford
Producto Machine Co., Bridgeport
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.
Whitney Mfg. Co., Hartford, Conn.

Milling Machines, Horizontal and Planer Type
Cincinnati Planer Co., Cincinnati
Cons. Mach. Tool Corp., Rochester
Ingersoll Milling Mach. Co., Rockford, Ill.
Niles-Bement-Pond Co., New York
Sellers & Co., Wm., Philadelphia
Shaw Crane-Putnam Mach. Co., Inc., Fitchburg, Mass.

Milling Machines, Plain
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker, Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Potter & Johnston Mch. Co., Pawtucket, R. I.
Producto Machine Co., Bridgeport
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Portable
Ingersoll Milling Mach. Co., Rockford, Ill.

Milling Machines, Thread
Hall Planetary Co., Bridesburgh, Philadelphia
Hanson-Whitney Machine Co., Hartford
Harrington Co., Philadelphia
Pratt & Whitney Co., Hartford
Producto Machine Co., Bridgeport
Waltham (Mass.) Mach. Wks.

Milling Machines, Traveling Work Table
Sellers & Co., Wm., Philadelphia

Milling Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Hendey Machine Co., Torrington, Conn.
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker, Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Potter & Johnston Mch. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.
U. S. Mch. Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Vertical
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Cons. Mach. Tool Corp., Rochester
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker, Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Potter & Johnston Mch. Co., Pawtucket, R. I.
Reed-Prentice Corp., Worcester, Mass.
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Worm
Cleveland Auto Mach. Co., Cleveland
Pratt & Whitney Co., Hartford
Producto Machine Co., Bridgeport
Waltham (Mass.) Mach. Wks.

Milling Tools, Adjustable, Hollow
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Geometric Tool Co., New Haven, Conn.

Motors, Electric
Allis-Chalmers Mfg. Co., Milwaukee
Burke Elec. Co., Erie, Pa.
Lincoln Electric Co., Cleveland
Ohio Electric & Controller Co., Cleveland
Reliance Elect. & Eng. Co., Cleveland
Wisconsin Elec. Co., Racine, Wis.

Name Plates
Schwerdtle Stamp Co., Bridgeport

Numbering Machines
Noble & Westbrook Mfg. Co., Hartford

Nut Tappers
(See Bolt & Nut Machinery)

Nuts, Castellated
National Acme Co., Cleveland

Oil and Grease Cups
Bay State Stamping Co., Worcester
Gits Bros. Mfg. Co., Chicago
Tucker, W. A. & C. F., Hartford, Conn.

Oil Filtering & Storage Systems
Bowser & Co., S. F., Fort Wayne.

Oil Grooving Machines
Manson-Whitney Mach. Co., Hartford

Oil Stones
Norton Co., Worcester, Mass.

Oils
(See Lubricants)

Paint
Spraco Painting Equipment Co., Boston

Painting Equipment
Spraco Painting Equipment Co., Boston

Parallels
Starrett Co., L. S., Athol, Mass.

Pattern Shop Machinery
(See Woodworking Machinery)

Patterns, Wood and Metal
Mehl Mach. Tool & Die Co., Roselle, N. J.

Pipe Cutting and Threading Machines
Bignall & Keeler Mach. Wks., Edwardsville, Ill.
Harrington Co., Philadelphia
Landis Machine Co., Waynesboro, Pa.
Merrell Mfg. Co., Toledo
Murchey Machine & Tool Co., Detroit
Saunders Sons, D., Yonkers, N. Y.
Williams Tool Corp., Erie, Pa.

Pipe Bending Machines
Harrington Co., Philadelphia

Pipe Fitters' Tools
Butterfield & Co., Derby Line, Vt.

Planer Machine Knives
Atkins & Co., E. C., Indianapolis

Planing Machines
American Tool Wks. Co., Cincinnati
Cincinnati (O.) Planer Co.
Cleveland (O.) Planer Co.
Cons. Mach. Tool Corp., Rochester
Gray Co., G. A., Cincinnati
Niles-Bement-Pond Co., New York
Ohio Machine Tool Co., Kenton, O.
Sellers & Co., Wm., Philadelphia
Shaw Crane-Putnam Mach. Co., Inc., Fitchburg, Mass.

Plate Rolls
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Barnes Co., W. F. & John, Rockford, Ill.
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Blount Co., J. G., Everett, Mass.
Clark, Jas. J. Jr., Electric Co., Louisville, Ky.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
New Britain Mach. Co., New Britain, Conn.
Rowbottom Mach. Co., Waterbury, Conn.
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Union Twist Drill Co., Athol, Mass.
Van Dorn Electric Tool Co., Cleveland
Van Norman Mach. Tool Co., Springfield, Mass.
Wisconsin Elec. Co., Racine, Wis.

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Post Boxes
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Press Feeds
Littell Mach. Co., F. J., Chicago
V. & O. Press Co., Hudson, N. Y.

Pressed Steel Parts
Standard Pressed Steel Co., Jenkintown, Pa.
Truscon Steel Co. (Hydraulic Pressed Steel Division) Cleveland

Presses, Arbor
Barnes Co., W. F. & John, Rockford, Ill.
Logansport Machine Co., Logansport, Ind.
Nicholson & Co., W. H., Wilkes-Barre, Pa.

Presses, Drop Forging
Bliss Co., E. W., Brooklyn, N. Y.
Niagara Machine & Tool Wks., Buffalo
Niles-Bement-Pond Co., New York
Toledo (O.) Mach. & Tool Co.

Presses, Foot and Hand
Adriance Mach. Wks., Inc., Brooklyn
Bliss Co., E. W., Brooklyn, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo
Taylor & Fenn Co., Hartford, Conn.

Presses, Forcing
Barnes Co., W. F. & John, Rockford, Ill.
Elmes Eng. Wks., Chas. F., Chicago
Lucas Mach. Tool Co., Cleveland
Watson-Stillman Co., N. Y.

Presses, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Presses, Power
Adriance Mach. Wks., Brooklyn
Barnes Co., W. F. & John, Rockford, Ill.
Bliss Co., E. W., Brooklyn, N. Y.
Cincinnati (O.) Shaper Co.
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo
Pels & Co., Henry, New York
Rowbottom Mach. Co., Waterbury, Conn.
Toledo (O.) Mach. & Tool Co.
V&O Press Co., Hudson, N. Y.

Presses, Screw
Barnes Co., W. F. & John, Rockford, Ill.
Bliss Co., E. W., Brooklyn, N. Y.

Profiling Machines
Pratt & Whitney Co., Hartford
Stark Tool Co., Waltham, Mass.

Pulley, Turning & Boring Machines
Niles-Bement-Pond Co., New York

Pulleys, Metal
American Pulley Co., Philadelphia
Brown Co., A. & F., Elizabethport, N. J.
Dodge Mfg. Corp., Mishawaka, Ind.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Jones Fdry. & Machine Co., W. A., Chicago
Link-Belt Co., Chicago

Pulleys, Paper
Ohio Valley Pulley Works, Maysville, Ky.

Pulleys, Steel Split
American Pulley Co., Philadelphia
Dodge Mfg. Co., Mishawaka, Ind.

Pumps, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Pumps, Lubricant and Oil
Bowser & Co., S. F., Fort Wayne.
Brown & Sharpe Mfg. Co., Providence

Pumps, Power
Bowser & Co., S. F., Fort Wayne.
Buffalo (N. Y.) Forge Co.

Pumps, Portable
National Acme Co., Cleveland, Ohio

Punches, Center
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Armstrong-Blum Mfg. Co., Chicago

Punches, Power
Bowser & Co., S. F., Fort Wayne, Ind.
Buffalo (N. Y.) Forge Co.
Ferracute Machine Co., Bridgeton, N. J.
Mitts & Merrill, Saginaw, Mich.
Niagara Mach. & Tool Wks., Buffalo
Pels & Co., Henry, New York

Punching and Shearing Machines
Buffalo (N. Y.) Forge Co.
Cons. Mach. Tool Corp., Rochester
Pels & Co., Henry, New York
Wickes Bros., Saginaw, Mich.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.

Racks, Cut
Adams Co., Dubuque, Ia.
Boston Gear Works Sales Co., Quincy, Mass.
Grant Gear Works, Boston
Hartford Special Machy. Co., Hartford
Meisel Press Mfg. Co., Boston

Reamer Holders
Landis Machine Co., Waynesboro, Pa.

Reamers, Adjustable
Barber-Colman Co., Rockford, Ill.
Brubaker & Bros. Co., W. L., New York
Cleveland (O.) Twist Drill Co.
Davis Boring Tool Co., St. Louis
Gammons-Holman Co., Manchester, Conn.
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford

Reamers, Solid
Barber-Colman Co., Rockford, Ill.
Brubaker & Bros. Co., W. L., New York
Butterfield & Co., Derby Line, Vt.
Cleveland (O.) Twist Drill Co.
Gammons-Holman Co., Manchester, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford
Producto Machine Co., Bridgeport
Reed Mfg. Co., Erie, Pa.
Union Twist Drill Co., Athol, Mass.

Reamers, Taper
Barber-Colman Co., Rockford, Ill.
Gammons-Holman Co., Manchester, Conn.
Pratt & Whitney Co., Hartford
Producto Machine Co., Bridgeport
Union Twist Drill Co., Athol, Mass.

Lad specializes on specialists.

"Here, Lad—

we've just had a big meeting about arc welding. We had the representative of an electric house tell us about welding and he's going to send us a machine along with the shipment of wire, wiring devices, lamps and reflectors he's sold us for the new plant.

Because of that we had to drop your proposal for a Lincoln 'Stable-Arc' machine although we had a perfectly open mind when we approached the subject."

"Yes, Pop—

and you got a welder that just approaches the 'Lincoln.'

The board realized that we have a lagging business and arc welding looks like the way to speed it up.

Then, they listen to theory from a man who has just left the city hall after selling some street lamps, and who called on the way out to sell some violet ray apparatus to the sanitarium and who drops in here to pick up an order for sockets.

Who is it that gives us salvarsan and vaccine, who gives us the hybrid flowers? The general practitioner, or the one who excludes all other interests but the one in hand?

That's why I suggested Lincoln—because they started arc welding, developed it, specialize in it, give you a machine with features (see panel) that produce more and better welding per day.

And the board had an open mind in the matter—you don't mean open, Pop—just merely vacant."

The Lincoln Electric Co.,
Dept. No. 3-12, Cleveland, O.

Only "Stable-Arc" Welders have all these features

Variable Voltage.
Laminated Magnetic Circuit.
Separately-excited Generator Field.
Double Control of Welding Heat.
Steady Arc Throughout Entire Welding Range.
All Steel Construction.
Full Capacity for either Metallic or Carbon Arc Welding.

These features make welding easier. Results—better welds and greater output.
Ask any Operator!

LINCOLN "Stable-Arc" WELDER

W-69

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Recorders, Pressure
Bristol Co., Waterbury, Conn.
Recorders, Temperature
Bristol Co., Waterbury, Conn.

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National Machinery Co., Tiffin, O.

Riveting Machines
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N. Y.

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Tucker, W. A. & C. F., Hartford, Conn.

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Starrett Co., L. S., Athol, Mass.

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Oakite Products, N. Y.

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Atkins & Co., E. C., Indianapolis
Racine (Wisc.) Tool & Mach. Co.
Starrett Co., L. S., Athol, Mass.
Thompson & Son Co., Henry G., New Haven

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Armstrong-Blum Mfg. Co., Chicago

Sawing Machines, Metal
Atkins & Co., E. C., Indianapolis
Earle Gear & Machine Co., Phila.
Peerless Machine Co., Racine, Wis.
Racine (Wis.) Tool & Mach. Co.
Thompson & Sons Co., Henry G., New Haven

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Armstrong-Blum Mfg. Co., Chicago.
Atkins & Co., E. C., Indianapolis
Peerless Machine Co., Racine, Wis.
Racine (Wis.) Tool & Mach. Co.

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Atkins & Co., E. C., Indianapolis
Thompson & Son Co., Henry G., New Haven

Saws, Circular Metal Cutting
Atkins & Co., E. C., Indianapolis
Saws, Circular Wood Cutting
Atkins & Co., E. C., Indianapolis
Saws, Cross Cut & Hand
Atkins & Co., E. C., Indianapolis

Saws, Hack
Arion Steel Co., Boston
Armstrong-Blum Mfg. Co., Chicago
Saws, Inserted Tooth
Atkins & Co., E. C., Indianapolis

Saws, Metal Cutting
American Saw & Mfg. Co., Springfield, Mass.
Racine (Wis.) Tool & Machine Co.

Saws, Milling
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Barber-Colman Co., Rockford, Ill.
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol, Mass.

Saws, Screw Slotting
Atkins & Co., E. C., Indianapolis
Union Twist Drill Co., Athol, Mass.

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Starrett Co., L. S., Athol, Mass.

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Anderson Bros. Mfg. Co., Rockford, Ill.
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Anderson Bros. Mfg. Co., Rockford, Ill.
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Cleveland Twist Drill Co., Cleveland, Ohio

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Eastern Mch. Screw Corp., New Haven
Morris Machine Tool Co., Cincinnati
National Acme Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

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Brown & Sharpe Mfg. Co., Providence
Cleveland (O.) Auto Mach. Co.
Cone Auto. Mch. Co., Windsor, Vt
National Acme Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

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Acme Machine Tool Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence
Cleveland (O.) Auto Mach. Co.
Dreses Mch. Tool Co., Cincinnati
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Co., Hartford

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Brubaker & Bros. Co., W. L., New York
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, O.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Winter Bros. Co., Wrenthan, Mass.

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Bristol Co., Waterbury, Conn.
Danly Machine Specialties, Inc., Chicago
Eastern Mch.Screw Corp., New Haven
National Acme Co., Cleveland
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., Cleveland

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Allen Mfg. Co., Hartford
Bristol Co., Waterbury, Conn.
Eastern Mch.Screw Corp., New Haven
National Acme Co., Cleveland

Screws, Safety Set
(See Screws, Cap & Set)

Seamless Steel Tubing
(See Tubing, Seamless Steel)

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(See Searchlight Section)
Brownell Machy. Co., Providence
Eastern Machinery Co., Cincinnati
Hill, Clarke & Co., Chicago
Miles Machy. Co., Saginew
Monarch Machine Tool Co., Sidney, O.
Morey & Co., N. Y.
Oesterlein Machine Co., Cincinnati
Osborne & Sexton Mchy. Co., Columbus
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Smith Mchy. Co., H. A., Syracuse
Strong, Carlisle & Hammond Co., Cleveland
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National Acme Co., Cleveland

Separators, Oil & Waste
Barrett Leon J., Worcester, Mass.
Dodge Mfg. Corp., Mishawaka, Ind.

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Bliss & Laughlin, Harvey, Ill.
Strand & Co., N. A., Chicago
Union Drawn Steel Co., Beaver Falls, Pa.

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Haskins Co., R. G., Chicago
Strand & Co., N. A., Chicago
White Dental Mfg. Co., S.S., N. Y.

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Cincinnati (O.) Shaper Co.
Hanson-Whitney Machine Co., Hartford
Hendey Machine Co., Torrington, Conn.
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Ohio Machine Tool Co., Kenton, O.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Pratt & Whitney Co., Hartford
Reed-Prentice Corp, Worcester, Mass.
Smith & Mills Co., Cincinnati
Springfield (O.) Machine Tool Co.

Shears, Hand
Tucker, W. A. & C. F., Hartford, Conn.

Shears, Power
Adriance Mach Wks., Brooklyn
Buffalo (N. Y.) Forge Co.
Ferracute Machine Co., Bridgeton, N. J.
Mitts & Merrill, Saginaw, Mich.
Niagara Mch. & Tool Wks., Buffalo
Pels & Co., Henry, New York
Toledo (O.) Mach. & Tool Co.

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Bliss Co., E. W., Brooklyn, N. Y.
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Sutton Engineering Co., Pitts, Pa.
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Philadelphia (Pa.) Gear Works
Sier Bath Co., N. Y.
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Bliss & Laughlin, Harvey, Ill.

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Union Drawn Steel Co., Beaver Falls, Pa.
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Union Drawn Steel Co., Beaver Falls, Pa.

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Columbia Tool Steel Co., Chicago Heights, Ill.
Crucible Steel Co. of America, New York

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Latrobe (Pa.) Electric Steel Co.
Ryerson & Son, Jos. T., Chicago
Timken Roller Bearing Co., Canton, O.
Truscon Steel Co. (Hydraulic Pressed Steel Division) Cleveland
Union Drawn Steel Co., Beaver Falls, Pa.
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Geometric Tool Co., New Haven, Conn.
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Jarvis Co., Charles L., Gildersleeve, Conn.
Moline (Ill.) Tool Co.
Murchey Mach. & Tool Co., Detroit
National Machinery Co., Tiffin, O.
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Card Mfg. Co., S. W., Mansfield.
Hanson-Whitney Machine Co., Hartford
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
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National Acme Co., Cleveland
Pratt & Whitney Co., Hartford
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Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland

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Jones & Lamson Mach. Co., Springfield, Vt.
Winter Bros. Co., Wrenthan, Mass.

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(See Case Hardening, etc.)

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Shore Instrument & Mfg. Co., Jamaica, N. Y.

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Bristol Co., Waterbury, Conn.

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Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Murchey Mach. & Tool Co., Detroit
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Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Corp., Boston
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Hall Planetary Co., Bridesburg, Philadelphia
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National Machinery Co., Tiffin, O.
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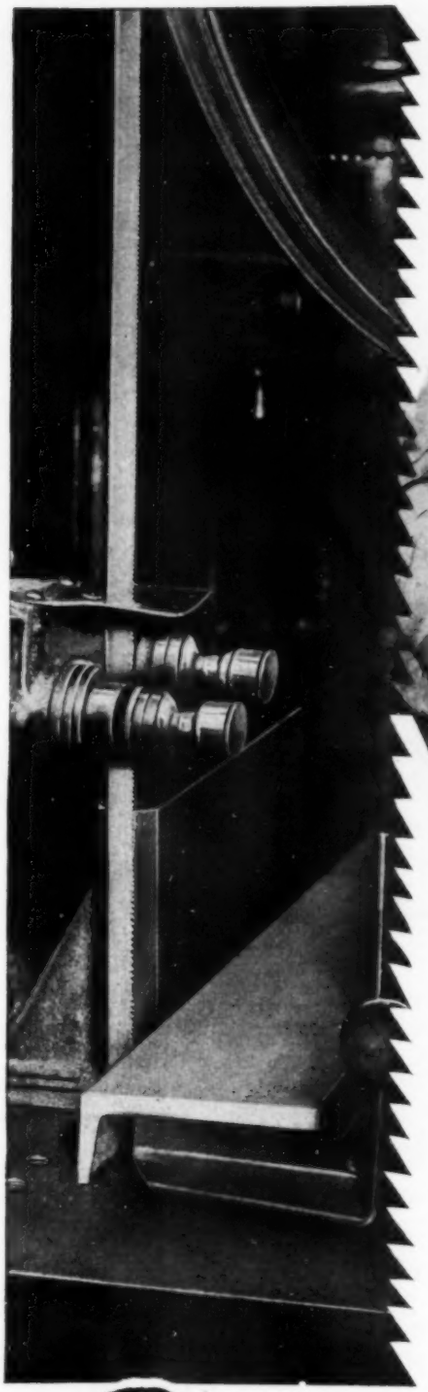
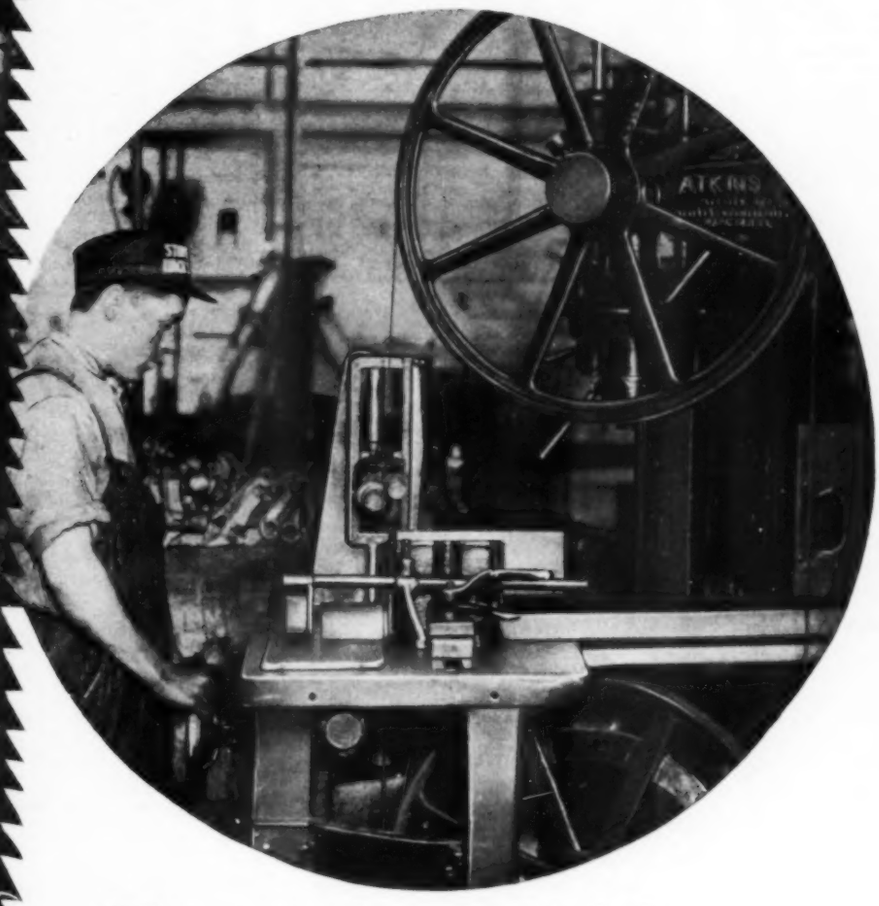
They More Than Doubled Production With Atkins Metal Cutting Band Saw





"Has more than doubled the production on all of our cutting jobs"

E. C. HEIM, *Tool Supervisor,*
Weaver Manufacturing Company,
Springfield, Illinois

This Atkins Metal Band Saw is in the plant of the Weaver Manufacturing Company, Springfield, Illinois. At the time the photograph was taken and the above comment was made it was cutting 5 x 2 x 7/16 channel at the rate of 8 an hour.

The Atkins line is designed and built to better previous production records.

Atkins Saws are willing performers. They are maintaining records all over the country—records which indicate with certainty what they will do for you. Shall we send data?

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American Tool Wks. Co., Cincinnati

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Armstrong Bros. Tool Co., Chicago
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Vises, Metal Workers'
Hollands Mfg. Co., Erie, Pa.
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Vises, Milling Machine
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U. S. Auto. Box Mchy. Co., Newtonville-Boston
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Butterfield & Co., Derby Line, Vt
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Cincinnati (O.) Planer Co.
U. S. Auto. Box Mchy. Co., Newtonville-Boston

Vises, Universal Machine
Hoggson & Pettis Mfg. Co., New Haven, Conn.
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Swift Electric Welder Co., Detroit

Welding Machines, Electric
Federal Mach. & Welder Co., Warren, O.
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Taylor-Winfield Corp., Warren, O.
Thompson Elec. Welding Co., Lynn, Mass.

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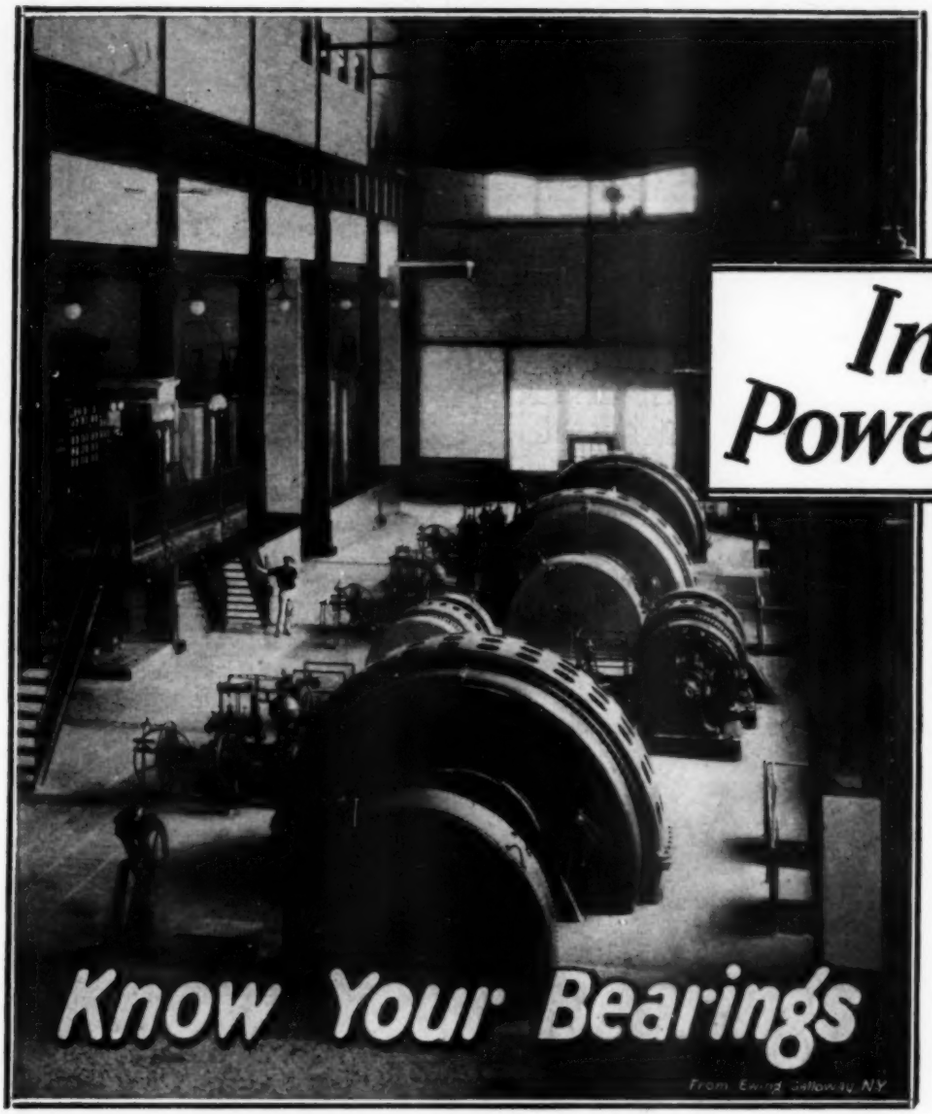

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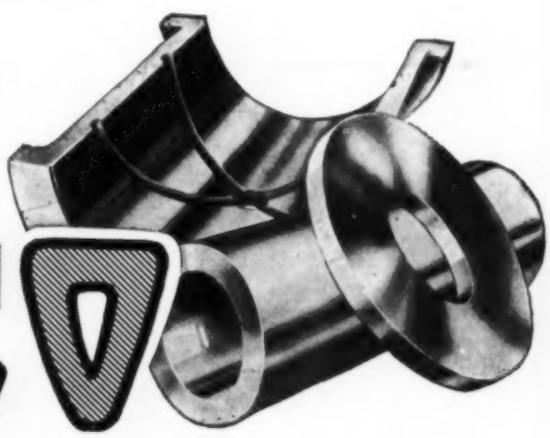

SABECO

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Dreses Machine Tool Co.	88
Earle Gear & Machine Co.	62
Eastern Machine Screw Corp.	88
Eastern Machinery Co.	109
Eclipse Interchange Counterbore Co.	98
Efficient Machine Shop	103
Eimes Engineering Works, Chas. F.	4
Errington Mechanical Laboratory	8
Etna Mach. Co.	92
Ex-Cell-O Tool & Mfg. Co.	98
Fafnir Bearing Co.	3rd Cover
Federal Machine & Welder Co.	64
Federal Products Corp.	89
Fellows Gear Shaper Co.	14-15
Ferracute Mach. Co.	94
Fitchburg Grinding Machine Co.	92
Flather Co.	76
Foote Bros. Gear & Machine Co.	62
Foote-Burt Co.	84
Fox Machine Co.	88
Franklin Machine Co.	103
Fredericksen Co.	121
Gallmeyer & Livingston Co.	82
Gammons-Holman Co.	98
Gears & Forgings, Inc.	62
Geometric Tool Co.	99
Giddings & Lewis Mach. Tool Co.	42
Gits Bros. Mfg. Co.	78
Gleason Works	69
Gorton Machine Co., George	78
Goss & de Leeuw Machine Co.	80
Graham Mfg. Co.	68, 82
Grant Gear Works	63
Grant Mfg. & Machine Co.	93
Gray Co., G. A.	42
Gray & Prior Machine Co.	88
Greaves-Klusman Tool Co.	44
Hall Planetary Co.	80
Hanson-Whitney Machine Co.	37
Hardinge Bros.	81
Harrington Co.	70
Hartford Special Machinery Co.	61, 103
Hartford Steel Ball Co.	102
Haskins, B. G., Co.	70
Hawkridge Bros. Co.	66
Heald Machine Co.	2nd cover
Hendey Machine Co.	50
High Speed Hammer Co.	93
Hill, Clarke & Co., of Chicago	106
Hill Clutch Mach. & Fdry. Co.	72
Hjorth Lathe & Tool Co.	76
Hoefer Mfg. Co.	84
Hoggson & Pettis Mfg. Co.	78
Hollands Mfg. Co.	68
Hookless Fastener Co.	109
Horsburgh & Scott Co.	61
Huhn Mfg. Co.	103
Illinois Steel Co.	115
Ingersoll Milling Machine Co.	18
International Machine Tool Co.	76
Jarvis Co., Charles L.	74
Johnson Machine Co., Carlyle	3
Johnson Gas Appliance Co.	77
Jones Fdry. & Machine Co., W. A.	72
Jones & Lamson Machine Co.	10-11, 104
Kearney & Trecker Corp.	22
Keller Mechanical Eng. Co.	102, 115
Kelly Co., R. A.	80
Kempsmith Mfg. Co.	80
Kingsbury Machine Tool Corp.	84
Krasberg Tool & Mfg. Co.	103
Landis Machine Co.	51
Landis Tool Co.	30-31
Langelier Mfg. Co.	92
Lapointe Co., J. N.	93
Lapointe Machine Tool Co.	92
Latrobe Electric Steel Co.	66
Leland-Gifford Co.	87
Lincoln Electric Co.	117
Lincoln Machine Co.	103
Link Belt Co.	111
Littell Machine Co., F. J.	94
Lodge & Shipley Machine Tool Co.	4-5
Logansport Machine Co.	92
Lowe, Henry A.	89
Lucas Machine Tool Co.	48
Magnolia Metal Co.	66
Marschke Mfg. Co.	82
Mehl Machine Tool & Die Co.	103
Meisel Press Mfg. Co.	63
Metal & Alloy Specialties Co.	93
Miles Machinery Co.	107
Milwaukee Die Casting Co.	91
Minster Machine Co.	94
Mitts & Merrill	80
Moline Tool Co.	84
Monarch Machine Tool Co.	41
Moore & White Co.	72
Morey & Co.	108
Morris Machine Tool Co.	84
Morrison Mach. Co.	62
Mosse Twist Drill & Mach. Co.	98
Murchey Machine & Tool Co.	99
National Acme Co.	26
National Machinery Co.	59
National Machine Tool Bldrs Ass'n.	2
National Twist Drill & Tool Co.	98
Newark Gear Cutting Machine Co.	68
New Britain Machine Co.	52
New Departure Mfg. Co.	19
Niagara Machine & Tool Works	95
Nicholson & Co., W. H.	98
Niles-Bement-Pond Co.	32
Noble & Westbrook Mfg. Co.	92
Norton Co.	38-39
Nuttall Co., R. D.	62
O. K. Tool Co.	96
Oakite Products	78
Oesterlein Machine Co.	109
Ohio Electric & Controller Co.	113
Ohio Machine Tool Co.	80
Oliver Instrument Co.	80
Osborne & Sefton Machy. Co.	109
Peerless Machine Co.	77
Pels & Co., Henry	94
Philadelphia Gear Works	60
Porter McLeod Machine Tool Co.	75
Positive Lock Washer Co.	99
Positions Vacant & Wanted	104-105
Potter & Johnston Machine Co.	20-21
Pratt & Whitney Co.	34-35
Precision Eng. Co.	103
Preis & Co., H. P.	74
Procunier Safety Chuck Co.	74
Producto Machine Co.	92
Quincy Compressor Co.	83
Racine Tool & Mach. Co.	77
Raybestos Co.	70
Reed Mfg. Co.	68
Reed-Prentice Corp.	24
Reliance Electric & Engineering Co.	72
Rhoads & Sons, J. E.	72
Rivett Lathe & Grinder Corp.	75
Rockford Drilling Machine Co.	84
Rockwell Co., Stanley P.	73
Rogers, Dayton A.	96
Rowbottom Machine Co.	81
Ryerson & Son, Jos. T.	88
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Saunders Sons, D.	72
Scherr Co., Geo.	68
Schwerdtle Stamp Co.	62
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Seneca Falls Machine Co.	70
Shaw Blue Print Machine Co.	96
Shaw-Crane-Putnam Machine Co.	47
Shepard Electric Crane & Hoist Co.	70
Shore Instrument & Mfg. Co.	89
Sier-Bath Co.	63
Siewek Tool & Die Co.	87
Simmons Machine Tool Corp.	107
Simonds Mfg. Co.	62
Simplex Wire & Cable Co.	70
Skinner Chuck Co.	73
Smith & Mills Co.	80
Smith Machinery Co., H. A.	109
South Bend Lathe Works	76
Spraco Painting Equipment Co.	88
Springfield Machine Tool Co.	76
Standard Conveyor Co.	71
Standard Electrical Tool Co.	82
Standard Gage Co., Inc.	89
Standard Pressed Steel Co.	102
Stark Tool Co.	76
Starrett Co., L. S., The	57
Steinle Turret Machine Co.	76
Stewart Die Casting Corp.	90
Strand & Co., N. A.	94
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Sutton Engineering Co.	93
Swift Electric Welder Co.	68
Taylor-Hall Welding Corp.	109
Taylor Winfield Corp.	64
Taylor & Fenn Co.	81
Thompson & Son Co., H. C.	77
Thomson Electric Welding Co.	64
Timken Roller Bearing Co.	36
Toledo Machine & Tool Co.	95
Torrington Co.	92
Travers Tool Co.	109
Tucker, W. W. & C. F.	78
Union Drawn Steel Co.	66
Union Electric Mfg. Co.	72
Union Mfg. Co.	74
Union Twist Drill Co.	25
U. S. Auto. Box Mchy. Co.	74
U. S. Drill Head Co.	84
U. S. Machine Tool Co.	81
U. S. Tool Company	92
Universal Boring Machine Co.	84
V & O Press Co.	94
Vanadium Alloys Steel Co.	66
Van Dorn Electric Tool Co.	4th Cover
Van Norman Machine Tool Co.	29
Veeder-Root	73
Vitrified Wheel Co.	82
Vulcan Crucible Steel Co.	66
Walker Co., O. S.	82
Waltham Machine Works	81
Walton Co.	94
Watson-Stillman Co.	94
Weldit Acetylene Co.	64
Westcott Chuck Co.	74
Westinghouse Elec. & Mfg. Co.	92
West Steel Casting Co.	78
White Dental Mfg. Co., S. S.	96
Whitney Mfg. Co.	53
Whiton Machine Co., D. E.	73
Wickes Bros.	76
Winter Bros.	99
Wisconsin Electric Co.	82